Abstracts.

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General.

1. An Industry Studies Fundamentals. Developments in the Petroleum Industry follow this Line. (Extracted from *Chem. and Met. Eng.*, Jan., 1925.)

The spirit of the petroleum industry is well exemplified by the American Petroleum Institute meeting at Fort Worth, Tex. It is a spirit that permeates not only research and technology, but the business policies of the industry. It is a spirit that will not tolerate a superficial or haphazard survey of the conditions facing the industry, but demands a study of fundamentals upon which to build a sound development.

This has led to investigations in research dealing with the mechanism of basic reactions. The chemistry of the refining processes has been studied, as, for example, the reactions involved when various refining agents are used in the removal of sulphur. This same spirit has brought engineers into the industry to study combustion and heat transfer, two of the most important and fundamental problems in petroleum refining. It has led to an investigation of fractional distillation that has already yielded remarkable results. There is a wider use of fractionating columns and they have been applied to fractions heavier than the ordinary naphtha fraction. This has resulted in better yields and better quality of products than can be obtained from ordinary equipment. Almost every company is developing towers and overhead equipment along its own ideas, but it is invariably better than earlier equipment.

The Vacuum distillation has been revived after almost 50 years of coma and applied to the distillation of bright lubricants from low-grade crude oils. The pressures in this work are unusually low, amounting to less than 1 in. of mercury.

Naturally no report of petroleum progress would be complete without a mention of the cracking processes. Considerable advance is reported and relatively great activity in installing new plants, especially those of the coil type of construction. This activity exists in spite of the great overproduction of crude oil, which would naturally have a tendency to slow down progress.

Several important developments have been recorded in the field of gasoline refining. Perhaps the most interesting one is the refining of gasoline in the vapour phase by means of fuller's earth. This is interesting both

theoretically and practically. It represents a type of process that is likely to be found increasingly during the next decade not only in petroleum refining, but in many other industries. And specifically this process seems to have many advantages that are encouraging. The use of hypochlorites has been further studied during the past year, and it is understood that commercial developments are under way on a large scale. Silica gel as a refining agent seems to have found a home in one of the plants of the Shell company, but no details of its success have come to light up to the present time. The so-called contact process for filtering lubricating oil reached large commercial proportions during 1924, particularly in the far Western refineries. California bentonite or montmorillonite—with or without acid treatment—has been found to give remarkable decolorising efficiency—in fact, tests have shown for this material a refining capacity as much as sixteen times that of ordinary fuller's earth.

During the past year there has been considerable agitation in connection with various dopes for gasoline. The net result has been to put the quietus on several well-advertised but practically useless products. The work by the Bureau of Standards shows that no real dope has been produced that gives an improvement in power or fuel consumption if there has been no detonation when operating with untreated gasoline. It is also true that dopes that are beneficial derive their value from the effect on detonation. Quite apart from these useless materials has been the development of tetraethyl lead in commercial quantity as a result of the pioneer work of the General Motors Corporation. From the industry's viewpoint the significant point is that if vaporisation and distribution of air-fuel mixtures can be improved somewhat, these anti-knock compounds will permit a still deeper cut into the kerosene fraction. This will naturally result in an increase in the available supply of motor fuel.

Nor would a review of the year be complete without mention of the revival of technical interest in oil-shale. Fundamental engineering knowledge has been accumulated in the Government and University laboratories, in the research departments of a few far-seeing oil companies and in the actual experience of several bona-fide organisations sincerely interested in oil-shale development. There is a growing realisation that when the time comes for actual utilisation of oil shale, the development must be carried on by the engineers of the petroleum industry. W. H. T.

2. Trinidad and its Petroleum Industry. H. R. Berry. *Petr. Times*, Dec. 13, 1924, XII, 310, pp. 937-942.

In the year 1911-1912 the production of crude oil in Trinidad amounted to nearly 10,000,000 Imperial gallons, and in 1924 had increased to 88,000,000 gallons. In the former year 1208 persons were employed in the industry and 40,418 ft. were drilled, while in 1924 the number of employees was 3935 and the footage drilled 142,371.

Details of the Pitch Lake and its operation are given. The pitch is not treated, except for removal of sand, water, etc., and is shipped in barrels for refining where used, Great Britain and the United States being the chief markets. The crude asphalt contains approximately 40 per cent. bitumen, 29 per cent. water, and 31 per cent. clay.

As regards petroleum, 90 per cent. of the present production is obtained in the vicinity of the Pitch Lake, the remaining 10 per cent. coming from the Barrackpore, Guayaguayare and Tabaquite fields. The present commercial production is obtained from strata of the Tertiary age, the lower horizon 1600-1850 ft. being the most prolific. Deeper sands at 2000-2200 ft. have recently been discovered, and the deepest well is 3,476 ft., but was a dry hole.

In the southern portion of the island there is no cap rock to the producing sands, which are found between two impervious clays When a well is brought-in the flow of oil from the sand reduces the pressure and the clay crumbles in, thus shutting off the oil. This has been overcome by the use of a blow-out preventer, and a recent device for drilling into the oil sand consists of drilling in with inserted pipe having no couplings, through a tightly fitted outer pipe, to allow just room for the drilling string to pass through, and to facilitate the placing of packing directly the well begins to flow.

A list of the companies operating in Trinidad is given, and also brief particulars of the operations of the Kern Trinidad Oilfields and the British Controlled Oilfields. A small scale map shows the roads and physical features of the Island. G. S.

3. Special Properties of Californian Petroleum. Roy Cross. *Oily Age*, 1924, **21**, 19.

In general all crude petroleums from California may be divided into two classes—(1) wax bearing crudes found almost exclusively in the Los Angeles basin in Southern California; and (2) non-waxy crudes in the northern fields. None are of strictly paraffin base nature and none give a residual oil suitable for cylinder stock. All residues are practically asphaltic, whilst the overhead distillates are of high viscosity. The crudes were chiefly investigated for their values as cracking stock for the production of gasoline by two methods of distillation—(*a*) distilling by fire and steam to produce the maximum of asphalt, all overhead distillates being sent for cracking; and (*b*) running down to coke and cracking the distillate. In the first gasoline, coking asphalt and low cold test fuel oil is obtained, while in the second the products are gasoline coke and fuel oil. In Californian natural gasoline the ratio between gravity and boiling temperature is high, indicating aromatic or cyclic compounds. Graphs and figures are given indicating the relation between distilling temperature and gravity in the gasoline, the vapour pressure in relation to temperature, the loss on coking distillation and the amount of asphalt produced and the average commercial gasoline yields from oils of varying gravities when cracking is employed. F. G. P. R.

4. Action of Bacteria on Hydrocarbons, with Particular Reference to their Action on Petroleum. F. A. Hessel. *Les Mat. Grasses*, 1924, **16**, 6936.

The author has repeated much of the original work on this subject and gives an account of the results he has obtained. Early investigators found that petroleum did not exert any bactericidal action on certain cultures or on bacteria capable of forming spores. This was followed by the discovery that garden earth contains organisms capable of converting methane, in the presence of oxygen into carbon dioxide. It was then found that other organisms may be obtained from the same source capable of oxidising the higher hydrocarbons, and the ease of oxidation increased with the number of carbon atoms present in the hydrocarbon. Thus pentane, hexane, heptane and octane are the least easily assimilated, while methane remains unattacked. Two forms of Bacterium Benzoli have been isolated from garden earth which attack benzene, toluene and xylene, converting them into carbon dioxide and water. Various phenols, *e.g.*, hydroquinone and acids, have also been isolated from the products, and it is probable that these are intermediate compounds in the oxidation.

Bacterial action may be used as a method of separating certain hydrocarbons. For example, naphthenes are hardly attacked by any bacteria, but *B. aliphaticum liquefaciens* attacks them slowly. Experiments have

shown that when mixtures of paraffins and naphthenes are treated with this organism, the paraffins are destroyed and the naphthenes left practically unaffected. This method proves of considerable use in the isolation of these hydrocarbons from admixed paraffins and has been carefully worked out by Tausz and Peters. By means of it they have identified various naphthenes present in petroleum distillates. S. F. B.

5. Surface Tension of Oil-in-Water and Water-in-Oil Emulsions. II. S. S. Joshi. *Kolloid-Zeit.*, 1924, **34**, 280-283.

The surface tensions of water-in-oil emulsions, in which sodium oleate acts as the emulsifying agent and olive and castor oil form the dispersive media, have been found to be the same as those of the oils themselves. It is therefore possible, knowing the surface tension of any emulsion, to decide whether the emulsion belongs to the oil-in-water or water-in-oil class. S. F. B.

6. The Interfacial Tension of some Aqueous Solutions against Oils, as Corrected for Specific Gravity. R. L. Howard and Torald Sollman. *J. Phys. Chem.*, 1924, **28**, 1291-1296.

The authors find that when determinations of the interfacial tensions of aqueous solutions against oils are made by the Donnan pipette, it is necessary to apply a correction for specific gravity. This correction is expressed by the formula :—

$$1\ FT = \frac{\text{drops W}}{\text{drops S}} \times \frac{\text{grav. S—grav. oil.}}{\text{grav. W—grav. oil.}}$$

where 1 FT is the corrected interfacial tension relative to water—1 ; Drops W are the number of drops formed in water ; Drops S the number of drops formed in the solution, and grav. S., grav. W. and grav. Oil are respectively the gravities of the solution, water and the oil.

Emulsifying agents were found to lower the interfacial tension so greatly that the correction for gravity becomes less important. Of the substances examined, soap was the most efficient substance for lowering the interfacial tension towards liquid petrolatum, olive oil and air. S. F. B.

7. On the Influence of Thin Surface Films on the Evaporation of Water. Gunnar Hedestrand. *J. Phys. Chem.*, 1924, **28**, 1245-1252.

By drawing a current of air over a water surface covered by thin films of oily substances in a special apparatus the author has examined the effect of these films on surface vaporation. The films of fatty acids cause very little, if any, decrease in the rate of evaporation, a fact in favour of the view that the surface molecules of the film and water are intermixed and partly "dissolved." The oil molecules do not prevent the escape of the water molecules until the film reaches quite a considerable thickness. This observation may be compared with the effect of the film on the surface tension, the latter only being affected when the oil molecules are closely packed together, *i.e.*, the film is fairly thick. These results support the views of Langmuir and others. S. F. B.

8. Sodium Hypochlorite Crystals. *Chem. Trade J.*, 1924, **85**, 677.

Ordinary sodium hypochlorite solution containing about 160 g. per litre of sodium hypochlorite is evaporated in a vacuum under such conditions that the boiling point is between 35–40° C. After 4–6 hours the solution contains approximately 43–50 per cent. of hypochlorite and a considerable amount of salt has separated out ; this is filtered off and the molten liquor cooled to 10–15° C. Sodium hypochlorite crystallises out and may be separated, washed with a little water and centrifuged. It contains 44 per cent. of sodium hypochlorite, 0·7 per cent. of chlorate and 55 per cent. of water. S. F. B.

9. THE COMPRESSION OF OIL GASES. *Chem. Age*, 1924, **11**, 600.

The liquid hydrocarbons, formed when oil gas is submitted to a pressure of 10 atmospheres, were found by previous workers to include olefines, naphthenes and benzoid hydrocarbons but practically no paraffins or acetylenes. Traces of monoalkyl-acetylenes were, however, found. Recent work has confirmed these results and extended them. Of the olefines present, those of the C_nH_{2n-2} type predominate over those of the C_nH_{2n} type, especially the C_5H_8 hydrocarbons which greatly exceed in quantity the C_5H_{10} members present. The higher fractions are exceedingly complex. They contain considerable amounts of oxygen and are very easily polymerised by various chemical agents. The various uses for the liquid are discussed. Further work on the subject is in progress. S. F. B.

10. AROMATIC HYDROCARBONS IN PETROLEUM. *Petr. Times*, 1924, **12**, 711.

The petrol and kerosene fractions from Burmah oil have been found to contain about 10 per cent. of aromatic hydrocarbons. Of those present in the petrol fraction, toluene forms by far the greater part, amounting to nearly 7 per cent. of the petrol, while the *o*- and *p*-xylenes account for another 2 per cent. Other hydrocarbons found in the higher boiling petrol fractions include cumene and mestylene, and these have also been identified in the kerosene fractions, together with *β-iso*amylnaphthalene, *m*-xylene and *p*-cymene. Of these the last forms the chief aromatic constituent. *β-iso*amylnaphthalene forms some 10 per cent. of the total aromatics present in the crude oil. The importance of the high toluene content for the production of explosives is emphasised. S. F. B.

11. CAN PETROLEUM BE TRANSFORMED INTO FOOD PRODUCTS? *Petr Times*, 1924, **12**, 1041–1042.

At the present time no commercial method for converting petroleum products into edible or even drying oils is known. Various methods for oxidising the complex mixture of hydrocarbons present in petroleum are known, some of which have given promising results, but the products cannot be compared with food products. Thus James has oxidised petroleum products at temperatures between 240° and 500° C. by means of suitable quantities of air, using either molybdenum or uranium oxides as catalysts. Using this method he found that gas and fuel oils proved the most suitable material for oxidation; the products consisted chiefly of fatty aldehydic acids and similar oxidation products, some of which are claimed to have valuable lubricating properties. More recently Sherlock and Blair have oxidised various hydrocarbons by means of air at temperatures between 650° and 720° and obtained formaldehyde only. As the latter may now be converted into carbohydrates, the oxidation of hydrocarbons to formaldehyde may be considered a step in the conversion of petroleum into foodstuffs. It should be noted that methane, which forms such a large proportion of natural gas, is very suitable for this purpose. Other investigators claim to have produced palmitic, stearic and oleic acid from petroleum. Rapid developments in this direction may, therefore, make possible the production of food from waste petroleum products. S. F. B.

12. THE PREPARATION OF "SYNTHOL" FROM CARBON MONOXIDE AND HYDROGEN. Franz Fischer and Hans Propsch. *Brennstoff-Chem.*, 1924, **5**, 201–208, 217–227. Compare *Brennstoff-Chem.*, 1923, **4**, 276.

The results of different experiments of Franz Fischer and Tropsch are that the reduction of CO to synthetic oil ("synthol") gives at first formaldehyde which thereafter by the alcalic contact is transformed to methanol. Later on, from the formaldehyde and the CH_3OH are formed different

compounds of higher molecular weight. It is advantageous to make use of iron turnings as a contact mass which is impregnated with the hydroxide or the carbonate of a strong base such as rubidium carbonate. The reaction temperature must be favourable for the synthol formation, but decomposition of the carbon monoxide may not occur. When using iron as a contact medium, 410° C. is a favourable temperature. The pressure must be 75 atmospheres at least. For the use of "synthol" as a motor fuel compare *Brennstoff-Chem.*, 1923, **4**, 281. H. I. W.

13. Petroleum from Vegetable and Animal Fats. *Petr. Times*, 1924, **12**, 770.

Mailhe has shown that, when the vapours of various vegetable oils are passed over suitable catalysts at temperatures between 500° and 600° C., depending on the particular oil employed, besides oxides of carbon, hydrogen and gaseous hydrocarbons, liquid hydrocarbons are also obtained on hydrogenation in the presence of nickel, these yield products similar to benzine and kerosene. Copper and aluminium or copper and magnesium were found to be the most suitable catalysts. The decomposition of castor oil at temperatures between 550° and 570° by means of aluminium fragments leads to the formation of aliphatic hydrocarbons, but at higher temperatures aromatics are also formed. Under similar conditions rape seed oil gives a product having a chemical composition similar to Borneo crude oil. Similar products were also obtained from shark oil and ground nut oil. The possibilities of the process, which is still on the laboratory scale, are discussed. S. F. B.

14. The Density of Carbon. H. G. Howard and G. A. Hulett. *J. Phys. Chem.*, 1924, **28**, 1082–1095.

The authors have determined the densities of various carbons by a modification of the volumeometer method using helium, which has been shown, to be adsorbed, to slight extent only, as the fluid. The density of active coconut charcoal was found to be of the order of 2·1, and it is claimed that the accuracy of the determination is high. Considerable variations in the densities of charcoals from different sources were found, and it is assumed that low densities indicate the presence of hydrocarbons, thus confirming the conclusions of various authors that all carbons consist of graphite more or less contaminated with various hydrocarbons. Samples of carbons heated to temperatures above 1400° C. all showed abnormally low densities. S. F. B.

15. Ignition of Gases. III. Ignition by the Impulsive Electrical Discharge. Mixtures of Paraffins and Air. R. V. Wheeler *J. Chem. Soc.*, 1924, **125**, 1858–1869.

The author has found that the mixture of air and methane most readily ignited by the high-tension spark contains a greater percentage of oxygen than that necessary for complete combustion or for maximum speed propagation of flame. For mixtures of the higher paraffins with air the reverse holds true. The igniting power of the discharge is apparently not affected by any insulating properties that these mixtures may possess. S. C. Lind in an addendum states that the rate of reaction between any combustible gas and oxygen is determined by the concentration of whichever gas has the greatest stopping power for the particular form of energy which activates it. This stopping power is determined by the density of the gas; this effect may be compared with the effect that the density has on the stopping power of a gas towards α-rays. S. F. B.

16. Ignition of Gases. IV. Ignition by a Heated Surface. Mixtures of the Paraffins with Air. W. Mason and R. V. Wheeler. *J. Chem. Soc.*, 1924, **125**, 1869–1875.

The authors have extended the researches on the ignition of methane-air mixtures by heated surfaces to mixtures of ethane, propane, butane and pentane with air. Mixtures of methane and air, as measured by ignition temperatures, are considerably harder to ignite than any of the others, the ease with which ignition occurs increasing as the series is ascended. Methane shows a similar anomaly to that described in the previous abstract. The duration of the period before inflammation occurs, when the walls of the reacting vessel are heated to a temperature appreciably higher than the ignition temperature, has also been used to measure the relative ease with which the mixtures are ignited. S. F. B.

17. Influence of Nitrogen Dilution on the Speed of Flame (I.). C. Campbell and O. C. de C. Ellis. *J. Chem. Soc.*, 1924, **125**, 1957–1960.

The authors have examined the retarding effect of nitrogen on flame propagation when ignition commences at the closed end of a tube. They have found that when the average speeds over the first 5 cm. under conditions as nearly uniform as possible are plotted against the calorific values of gas mixtures containing sufficient oxygen for complete combustion, a straight line is obtained. The curves obtained previously by Dixon for methane, ethylene and acetylene under almost similar experimental conditions were due to incomplete combustion in the head of the flame. S. F. B.

18. Influence of Nitrogen Dilution on the Speed of Flame (II.). O. C. de C. Ellis and S. R. Stubbs. *J. Chem. Soc.*, 1924, **125**, 1960–1963.

Under the heading of "thermal conductivity" the authors have included other variables which affect the speed of flame, such as viscosity, density and specific heat. For groups of mixtures of carbon disulphide and air having equal calorific values, the speeds of the flames in them have been found to be proportional to their "thermal conductivities." S. F. B.

19. Process of Conversion of Gaseous Aliphatic Ethylene Hydrocarbons into Liquid Hydrocarbon. Ricard, Allenet and Cie. E.P. 202,311 of Aug. 9, 1923. Conv. (Belgium) Aug. 9, 1922.

Ethylene hydrocarbons are polymerised in contact with anhydrous aluminium chloride suspended in petroleum ether or petrol. Into an enamelled iron digester (capacity 500 litres) is placed 100 litres petrol and 20 kg. anhydrous aluminium chloride. The digester is fitted with a reflux condenser. Ethylene is passed in with continuous stirring, a pressure of 3 kg. per sq. cm. being maintained. The digester becomes full of liquid and certain amount may be drawn off, or the whole may be treated with water. On distilling the product the petrol is recovered and a pale yellow liquid of slight characteristic odour. T. A. S.

20. Fuel for Internal Combustion Engines. B. H. Morgan. E.P. 225,685 of Aug. 15, 1924.

As a fuel for internal combustion 60 to 30 parts by weight of alcohol and 30 to 60 parts of ether are mixed, and to the mixture about an equal weight of petrol is added, together with up to 5 per cent. of castor oil. The alcohol need not be absolute alcohol. The addition of the petrol causes the mixture to distil at lower temperatures than either the alcohol-ether mixture or the petrol alone. The castor oil assists in lubrication and diminishes the difficulties due to formation of acid, serving as a protective covering for tanks, pipes and carburettors. H. M.

21. Improvements in or relating to Bituminous Emulsions. J. A. Montgomerie. E.P. 226,032 of Dec. 8, 1923.

Aqueous bituminous emulsions for road making, for coating structures or for briquette making, etc., are obtained by treatment of bitumen with dilute aqueous caustic alkaline solution, the melted bitumen being preferably poured into the hot alkali solution with agitation, at a temperature of about 100°. As an example, 800 parts by weight of Mexican asphalt and 4 parts of caustic potash dissolved in 560 parts of water may be used. A small amount of soap may be added to make the emulsion more permanent. If desired, the hot alkali solution may be added to the melted bitumen.

H. M.

22. Improved Process for Utilising Hydrocarbons in Internal Combustion Engines. D. Bapachowsky and P. Claire. E.P. 225,255 of July 30, 1923.

Heavy hydrocarbons are utilised in internal combustion engines by fitting, between the carburetter and inlet valves of the engine, a catalysing unit heated by the exhaust gases and consisting of tubes of catalysing metal. Sufficient of the heavy material is cracked, on passing through the catalyser, to ensure complete combustion of the whole charge when it enters the engine. The admission of steam to the catalyser causes hydrogen to be evolved with subsequent hydrogenation of the hydrocarbons. The deposition of carbon is thus prevented. An engine fitted with this device is started on petrol.

T. A. S.

23. Improved Process of Manufacture of Hydrogen. Oxyhydrique Francaise. E.P. 206,822.

Hydrogen may be prepared by passing super-heated steam over iron previously reduced by any hot reducing gas, *e.g.*, coke oven gas. The process can then be repeated, the excess of hot reducing gas issuing from the plant being used to heat the steam or returned to the main gas plant. S. F. B.

24. Process of Dehydrating Alcohol. Ricard, Allenet et Cie. E.P. 210,761.

Alcohol may be dehydrated by the usual dehydrating agents for organic liquids when mixed with substances miscible with alcohol but not with water, other than petrol, gasoline or liquid hydrocarbons. Suitable substances comprise chlorinated derivatives of the aliphatic aromatic series, nitro-bodies and the like, while potassium or sodium carbonates, calcium carbide, sulphates of iron, sodium or manganese form suitable dehydration agents.

S. P. B.

Testing.

25. Fuel for Motors. A. A. Backhaus, Assr. to U.S. Industrial Alcohol Co. U.S.P. 1,516,907 of Nov. 25, 1924. (Appl. May 28, 1921.)

The fuel consists of a petroleum distillate and absolute methyl alcohol.

T. A. S.

26. Fuel Mixture containing Oxidised Petroleum Products.—H. M. Weber, Assr. to Ellis-Foster Co. U.S.P. 1,516,757. Nov. 25, 1924. (Appl. April. 23, 1923.

A motor fuel containing an oxidised petroleum product and an oxidised paraffin.

T. A. S.

27. A NEW SLUDGING TEST FOR TRANSFORMER OILS. W. H. Nuttall. World Power 1924, 2, 92.

The tendency of an oil to sludge or deposit soild matter on oxidation is generally dependent on the amount of unsaturated hydrocarbons present and whereas the determination of these bodies by means of iodine value or the Michie Tests require considerable time and are not always reliable, the physical method adopted by the author is rapid and concordant in its results. The method is based on the fact that while pure saturated hydrocarbons have little or no affinity for water or aqueous solutions, unsaturated hydrocarbons possess a marked affinity. This can be readily demonstrated by allowing a drop of each class of oil to touch the surface of water, the saturated oil retains a globular form and the unsaturated oil spreads out into a film over the surface.

The formation of a drop of oil in water is dependent on three distinct surface tensions, viz.,

T_1 The surface tension of the oil.
T_2 The surface tension of the water.
T_{12} The interfacial tension between the oil and water.

When T_2 is less than T_1 and T_{12} the globular form will obtain, but if T_2 is less than T_1 and T_{12} the oil will film instead of forming a drop.

As T_1 and T_2 are constant the determining fraction is T_{12} and is determined experimentally.

In view of the fact that sulphuric acid is used for refining Transformer Oils the author uses this (40 per cent. vol.) instead of water and so makes the difference greater in the result obtained for high and low grade oils but in the case of highly unsaturated oils weaker acid is used. The apparatus consists of a graduated 10 c.c. pipette, the top of which is replaced by a piece of capillary tubing. This must be of uniform bore and wall thickness and the end must be ground down to an even surface of 90° to the axis of the tube. The upper end of the pipette is connected to two dropping funnels filled with mercury. The pipette is filled with 40 per cent. sulphuric acid by running mercury out of the funnel. After filling, the sides of the capillary are carefully wiped free from acid, and while a drop is forming on the tip the pipette is immersed below the surface of 30 c.c. of the oil contained in a 50 c.c. cylinder. 9 to 10 c.c. of acid are allowed to flow and the number of drops counted and actual volume of the drops calculated. The operation can be completed in 25–30 minutes and experiments on a number of oils show that the calculated interfacial tension is inversely proportioned to the actual sludge value.

S. B.

28. A FORMULA FOR THE CALCULATION OF THE TEMPERATURE CORRECTION IN PRACTICAL DETERMINATIONS OF THE CALORIFIC VALUE. B. Andersen. Tids. Kenii Bergvaesen, 1924, 4, 53.

The suggested formula $\ldots \Sigma \Delta t = (n/3)(2\Delta_2 \text{ plus } \Delta_1)$ was derived empirically from the graph of the temperature curve, and Δ_2 being the average temperature variations before and after the main reading period. The determinations were made on a Berthelot calorimeter with Ni-steel bomb using 25 atmospheres of oxygen and automatic stirring. A table giving the results of 12 determinations is shown and when calculation is made from the above formula the error was found to be only ·09 per cent. as against ·47 per cent. from Langheims formula. The author uses glass bulbs for liquid fuels, these being readily broken when the pressure is applied.

S. B.

29. Modification in Laboratory Apparatus. T. S. Patterson. J. Soc. Chem. Ind. 1924, 43, 281T.

Some useful modifications of apparatus commonly employed in chemical operations are described.

A condenser consisting of a central tube with two concentric water jackets acts as a reflux when placed down the neck of a flask. It has the further advantage of admitting fresh material to the flask without removal.

A new form of extraction apparatus consists of a wide tube constricted at one end to fit into the flask containing the solvent. Resting in the constricted part of the tube are two concentric glass vessels, the outer one sealed at the bottom end and the inner one closed with cloth or other filtering medium and containing the material to be extracted. Above these vessels is inserted a small internal condenser. The material is thus constantly immersed in the hot fresh solvent and so facilitates extraction.

The preparation of gases by dropping a reagent from a tap funnel into a flask is often difficult on account of the back pressure developed. This is overcome by connecting the tip of the funnel to the gas delivery tube, thus balancing any pressure produced. Acid fumes produced during reactions are absorbed in a small water scrubbing tower filled with pumice. Instead of the usual sodium wire press fitted with a single hole die the author has a die containing 5 to 10 holes. A useful test tube stand is described where the tubes are inverted and inclined so that the mouth of each tube rests on the stand at one point only. This ensures rapid draining and drying of the tubes.

S. B.

30. A New Type of Viscometer. G. Galli and M. Tenani. *Giorn. Chim. ind. appl.*, 1923, **6**, 280.

The instrument used for the determination of viscosity of thick oil consists of two parallel metal discs separated from each other by a small distance and rotatable about the same axis. The lower disc is set in motion at a slow uniform speed determined by a counter, and the upper disc resting on agate bearings is held by a soft antagonizing spiral, so that any movement is a measure of the couple tending to rotate it. When the two discs are immersed in the oil to be tested the lower disc on rotating causes the upper disc to move the deviation of this being proportional to the couple, i.e., the viscosity of the oil.

Formulae and curves are given showing the relation of the results to Engler viscosities.

S. B.

31. The Bone and Wheeler Gas Analysis Apparatus. C. S. W. Grice and W. Payman. *Fuel*, 1924, **3**, 236.

Complete illustrations and directions are given for the use of this apparatus in routine work and research. Useful hints on the preparation of reagents, typical analyses, precautions and sampling are given together with special instruction for various types of gases and mixtures.

S. B.

32. Standard Specifications for Fuels for Heavy Oil Engines (Petroleum and Shale Oils). *Brit. Eng. Standards Ass.* 1924, Pamphlet 209, 16 pages.

Specifications are given for four grades of oil. For all grades the minimum limit for closed flash point is 150° F. The specifications vary chiefly in respect of the maximum hard asphalt content permissible and the viscosity. The maximum hard asphalt content allowed for grade A is 0·5 per cent.; for grade B, 2 per cent.; for grade C, 4 per cent.; and for grade D, 12·0 per cent.

The maximum ash content allowed for grade A is 0·01 per cent. (an exceedingly low figure), whilst for the other three grades the limit is 0·05 per cent. The viscosity by Redwood No. 1 instrument for grade A at 100° F. must not exceed 75 secs., and for grades B, C and D; 250, 750 and 1500 secs. respectively. The water content is limited to 0·5 per cent. for grade A, the limit for the other three grades being 1·0 per cent. The maximum limit of the cold test is for grade A, 20° F.; for B, 35° F.; for C, 40° F. and for D, 45° F. Appendices give the methods of testing which are those specified by the Institution of Petroleum Technologists.

H. M.

33. The Determination of Methane-Hydrocarbons in Technical Gas Analysis. H. Tropsch and E. Dittrich, *Brennstoff-Chem.*, 1924, **5**, 285–286, 325.

The well-known method of Jaeger takes advantage of the wide difference in the ignition point of CH_4, C_2H_6, etc., as compared with H_2 to separate the hydrocarbons on the one side and hydrogen to the other by fractional combustion. The most preferable combustion tube is a transparent quartz tube filled with granulated copper oxide. When the methane-hydrocarbons contain methane and ethane T and D, use oxygen free from nitrogen to flush out the quartz tube before and after combustion. The CO_2 formed and the added oxygen are determined in the ordinary way. The volume of the remaining gases subtracted from the volume of the used gas gives the contraction. From the contraction in volume after the combustion and from the quantity of CO_2 formed, the methane- and ethane-percentage can be calculated easily. The oxygen used is prepared by electrolysis. The method has the advantage that afterwards the reoxidation of copper in the quartz tube is not necessary.

H. I. W.

34. Contribution to the Knowledge of Polymerisation of "Solventnaphta." R. Kattwinkel. *Brennstoff-Chem.* 1924, **5**, 5—6, *compare Brennstoff-Chem.*, 1922, **3**, 357.

Polymerisation of phenol containing "solventnaphta" at low temperature can be effected by means of concentrated sulphuric acid, when a small quantity of boric acid or of phosphorpentoxide is added.

H. I. W.

35. The Combustion of Methane to Formaldehyde. H. Tropsch and O. Roelen. *Brennstoff-Chem.*, 1924, **5**, 37—42.

The absolute quantities of formaldehyde on the incomplete combustion of methane are but small. A rapid cooling of the gases heated to reaction-temperature increases the percentage of formaldehyde. If we calculate the yield of formaldehyde as per cents. of *burned* methane then the highest percentage is reached as low temperatures. Formaldehyde is the most important product of the reaction between oxygen and methane, for at 700° a yield of 70·5 per cent. formaldehyde can be obtained.

H. I. W.

36. Determination of Velocity of Vaporization of Gasoline. G. Polcick and H. Fritz. *Brennstoff-Chem.*, 1924, **5**, 371—372.

The volume of air necessary for the complete vaporization of a determined quantity of gasoline in an apparatus of special construction was determined. The apparatus will be standardised by "das Brennstofftechnische Studien büro, Wien III."

H. I. W.

37. Determination of Softening Points and of the Content of "Carbon," especially of Pitch of High Melting Point. M. Dunkel. *Brennstoff-Chem.*, 1924, **5**, 186–189, 270.

Different methods of determining the softening points of pitch are compared and a new method is given.

H. I. W.

Refining.

37A. Contributions to the Technique of High Vacuum Distillation of Petroleum. W. Allner. *Petroleum*, 1925, **21**, 5–11.

Roumanian Minus-Pacura, a residue of asphaltic base crude from which the lighter fractions up to kerosene have been removed by topping, was worked up by high-vacuum distillation with a view to obtaining the maximum yield of lubricating oils, particularly for use on large gas engines. The plant of the Brünn-Königsfeld type, consisted of a battery of 8 stills in series, of which 6 were generally in use, each of 25 tons effective content, each connected with a dephlegmator, where the heavier fractions were condensed, and a tubular cooler, where the lighter fractions were collected. The temperature is higher in each successive still of the series, with an increase in *d*, flash point and viscosity of the products. The hard asphalt content abruptly rises in the product from the fifth still. The yield consisted of 8–10 per cent. of gas oil, 17 per cent. of "thinning oil" for addition to lubricating fractions, 40 per cent. of machine oil, 10 per cent. of spindle oil, 5 per cent. of cylinder oil, and also 17 per cent. of petroleum pitch and 3 per cent. loss, or alternately 7 per cent. of petroleum coke and 10 per cent. loss. The cuts for gas oil, spindle oil and machine oil were at 125°, 160° and 220° C. respectively. The vapours, after passing through dephlegmator and tubular cooler, enter a water condenser, where a considerable amount of kerosene was condensed, and the permanent gases were removed by a pump. A vacuum of about 450 mm. was employed. Redistillation of the principal primary products was effected with a vacuum of about 600 mm. The yield of lubricating oils was 55–60 per cent. of the raw material. Graphs showing temperatures of distillation and properties of the distillates are given.

H. M.

38. Why Sweetening in Refining? G. L. Wendt. *Petroleum Age*, 1925, **15**, 17.

"Sour" oils are defined as oils which give a positive reaction to sodium plumbite solution, any oil failing to do so being said to be "sweet." Sour oils owe their property of reactivity with sodium plumbite to the presence of hydrogen sulphide or mercaptans. The removal of the hydrogen sulphide presents no difficulties. As it is a gas, it tends to accumulate in the light fractions and can be removed from them completely and effectively by means of caustic soda, the addition of litharge being unnecessary. From heavier oils it can be removed by blowing, boiling or allowing to stand for several days when it escapes into the air.

Mercaptans, however, are not so readily removed. Instead of being gases they are oils and consequently cannot be removed by boiling or blowing. They react with caustic soda to give sodium mercaptides but as these are partly soluble in the oil, sweetening is incomplete. If, however, lead is present, insoluble lead mercaptides are thrown down completely and the air no longer gives a positive indication with plumbite. The addition of sulphur is quite unnecessary with light naphthas, but becomes necessary with heavier oils. The action of the sulphur is to oxidise the lead mercap-

tides to the corresponding disulphides and lead sulphide; it is owing to the formation of the latter that the darkening occurs, which always accompanies the addition of sulphur. Free sulphur when present in the oil acts in the same way. As the disulphides are comparatively sweet smelling and do not react with plumbite, they are considered sweet, but it should be noticed that the actual sulphur content is not reduced unless free sulphur is present, when it is removed as lead sulphide. Sodium hypochlorite is stated to act in a somewhat similar way, the oxygen of the hypochlorite oxidising the mercaptans to disulphides which remain in the oil. The latter are stated to be unaffected by this refining agent.

S. F. B.

39. Further Facts about Activated Carbon. *Petroleum Times*, 1924, **12**, 708.

H. Kresse gives the following facts in the *Chem.-Zeit.* The activity of a carbon is in proportion to its specific gravity. those having a gravity nearest to graphite, 2–2, being the most active. Exact determination of the gravity is, however, a difficult matter. Harkins evacuated carbon at 40° C. and saturated it with kerosene of known specific gravity. Hullett evacuated at 300–400° C. and saturated with water and got much lower values than Harkins. The latter confirmed Hulett's results with water, but with benzine and similar liquids obtained even higher results than with kerosene. Cocoanut shell is well known as providing very active carbon. Unsaturated hydrocarbons, such as acetylene, also furnish an active carbon when decomposed at about 700° C., but saturated hydrocarbons such as methane, ethylene and benzine give a carbon residue which is quite inactive. Activity seems therefore to be the product of unsaturated hydrocarbon linkages. Active carbon appears to form a protective covering to adsorbed materials; thus anthracene with a boiling point of 380° C. is retained unchanged in carbonised cedar wood at 850° C. Active carbon can be produced at relatively low temperatures with the assistance of a catalyst, as from CO in the presence of iron oxide. Or it may be made from certain woods, nut shells, etc., but not from coals, petroleum or other mineral carbonaceous material by direct thermal decomposition followed by superheated steam. Kresse considers that activity is due to both physical and chemical action, adsorption being physical whilst the rate of chemical action is proportional to the area of contact surface. Active carbons are readily oxidised and many act as reducing agents at ordinary temperatures, like colloidal sulphur and platinum. The catalytic property of colloidal matter enters largely into adsorption phenomena. This action quickly stops adsorption in the case of sulphuretted hydrogen owing to filling of the pores of the carbon by elemental sulphur. It seems improbable that carbon can replace finely divided metals as practical reducing agents. Active carbons do not all act in the same way, some being able to bring about the reaction $CO+Cl_2=COCl_2$ others not. This reaction, however, soon ceases owing to preferential adsorption of chlorine.

F. G. P. R.

40. Active "Carbon." Werner Mecklenburg, Aussig a. E. *Zeit. f. angewandte Chemie*, 1924, **37**, 873–877.

The two principal methods of preparation of activated "carbon" are discussed: (1) The carbon-containing raw material is charred. The carbon thus formed, which is but slightly active, is treated in a second stage with suitable chemical compounds in order to activate it (f.i. steam-"carbon," which has become active by treatment of charcoal with steam at 1000° C., and the alkali-"carbons," which are obtained by heating charcoal with alkalicarbonate at the same temperature). (2) With the second method,

the two stages mentioned above are combined. The wood impregnated with alkalicarbonate is heated to a temperature of 1000° C. Higher temperatures are not necessary. One of the best known decolorising "carbons" (the so-called carboraffin) is prepared by carbonisation of wood impregnated with a solution of $ZnCl_2$ at a temperature of 500° C.

Some more details of different types of carbon and of the individual adsorption properties are given.

H. I. W.

41. The "Boormann" System of Distilling Crude Oil. *Petroleum Times*, 1924, **12**, 649.

The disadvantages of the usual method of distillation consisting in production of coke and colouring matter are due to the prolonged heating to which large volumes of oil are subjected. In the Boorman system the crude oil flows through a preheating coil of 100–200 litres capacity, and having reached a given temperature is passed into a distillation column where it is continuously distilled by means of superheated steam as is done with alcohol or ammonia water. In the preheater benzine, kerosene and a part of the gas oil are taken off, as well as any water in the oil, all the heavier fractions down to asphalt being distilled in the steam chamber. The claims made for this system are cheapness, greater efficiency, ease of handling and reduction of fire risks.

F. G. P. R.

42. Elimination of Acids from Vegetable Oils by Adsorption. *Z. Angew Chem.*, 1924, **37**, 70–71.

Fatty acids, when present in vegetable oils to the extent of one per cent. may be removed by adsorption. A list of suitable absorbents, arranged in order of their efficiencies, is given. Wood charcoal is stated to be the most effective; the carbonates and hydrates of magnesium and calcium are also effective but their activity is probably due to chemical action. In one experiment, magnesium hydrate reduced the fatty acid content of a vegetable oil from 1·12 to 0·12 per cent.

S. F. B.

43. Process of and Apparatus for Refining Crude Oils. Claude Leslie Freeland. U.S. Pat., 1,516,285.

The inventor claims a simple, easily controllable and economical process and apparatus.

The process consists of pumping the oil through a heater composed of parallel tubes, which connect headers at each end of an outer cylindrical casing. Steam is used to heat the oil. The hot oil is sprayed into a second vessel composed of concentric tubes. The outside casing is steam heated and the oil is sprayed into the inner tube at an angle in order to impart a whirling movement whereby the heavier vapours separate. The light vapours are drawn from the centre and the heavy vapours from the circumference of the tube.

R. P.

44. Process and Apparatus for Refining Crude Oils. C. L. Freeland. U.S. Pat., 1,516,285, 18 Nov., 1924. (Appl. Oct. 10, 19.

Oil is heated and passed into a horizontal device consisting of concentric tubes, in which a whirling motion is imparted to the oil. Vapours are taken off from the centre of the whirling oil.

T. A. S.

45. Refining Material. R. Cross. U.S. Pat., 1,515,733, Nov. 18, 1924. (Appl. Dec. 31, 1923.)

A metal salt, having a high affinity for the sulphur compounds contained in hydrocarbon oils is combined with a highly absorbent inorganic material to form a refining agent for petroleum.

T. A. S.

46. Treating Gases (containing Olefines). G. Mesereau. U.S. Pat., 1,509,603.

Gases containing olefines are passed together with chlorine into the bottom of a tower where they are sprayed by water or by chlorinated hydrocarbons obtained from a previous run. The temperature at which the reaction occurs is controlled by the rapidity with which the liquid is circulated.

S. F. B.

Pure Chemistry.

47. The Behaviour of Sulphur and Amorphous Carbon at High Temperatures. J. P. Wibaut and G. LaBastide. *Rec. trav. Chim.*, 1924, **43**, 731–756.

When amorphous carbon is heated with sulphur at 600° for a considerable period in a closed tube, substances are produced resembling carbon but containing from 18–25 per cent. of sulphur. This sulphur cannot be extracted to any considerable extent with solvents such as carbon disulphide. By heating these sulphur containing substances at 600° in a vacuum, the greater part of the combined sulphur is eliminated. Thus, while the greater part of the sulphur in the "sulphurous carbons" with a high sulphur content is rather loosely combined, a smaller portion is held in some other manner but more firmly, for during the heating in a vacuum small quantities of carbon disulphide are formed. The separation of CS_2 takes place in stages: at 800° and at 1000°, and frequently some carbon disulphide is formed. Finally, a part of the sulphur remains firmly combined with the carbon, for after heating at 1100° in a vacuum of 0·5 m.m., these "sulphurous carbons" still contain about 2·8 per cent. of sulphur. Different modifications of carbon do not behave in the same manner when heated with sulphur. For instance the authors noticed that finely divided artificial graphite fixes little or no sulphur, while under the same conditions amorphous carbon, prepared from sugar charcoal, fixes great quantities of sulphur. The authors think that this cannot be explained by the replacement of hydrogen by sulphur, for the samples of carbon used contained only 2–5 per cent. of hydrogen. When we consider that, by the action of sulphur, two atoms of hydrogen were replaced by one atom of sulphur, then from a "carbon" containing 2–5 per cent. of hydrogen, a substance containing about 3–7·5 per cent. of S would be formed. The quantities of sulphur are, however, much larger. In addition, the "sulphurous carbons" when heated in a vacuum still furnish H_2S, so that all the hydrogen contained in the "carbon" is not replaced by sulphur. The authors have proved that almost pure amorphous carbon can fix large quantities of sulphur. H. I. W.

48. On the Influence of some Non-Inflammable Vapours of Organic Liquids on the Limits of Inflammability of Methane-Air Mixtures. W. P. Jorissen and J. Velisek. *Rec. trav. Chim.*, 1924, **43**, 80–86; W. P. Jorissen and J. C. Meuwissen, *ibid.*, II., 591–597.

Experiments with different substances were made with an apparatus described in the paper. The obtained results were:—

Temperature.	Vapour added.	Limits of inflammability.
16°—17° ..	— ..	5·4 and 14·1%
9° and 10° ..	Perchlorethylene 0·7 and 0·8% ..	7·35 and 10·15%
11° and 12° ..	Tetrachlorethane 0·7 and 0·8% ..	7·15 and 9·15%
10° ..	Pentachlorethane 1·0% ..	5·95 and 10·3%
11° ..	Dichlorethylene 20·0% ..	No explosion
13° ..	Trichlorethylene 5·5% ..	No explosion
13° ..	Carbon tetrachloride 8·5% ..	9·0 and 9·9%
20° ..	Carbon tetrachloride 12·2% ..	No explosion

H. I. W.

49. Process of Conversion of Gaseous Aliphatic Ethylene Hydrocarbons into Liquid Hydrocarbons. Ricard, Allenet et Cie. E.P. 202,311.

Gaseous ethylenic hydrocarbons of the aliphatic series can be readily converted into liquid hydrocarbons by passing them into a suspension of aluminium chloride in gasoline or petroleum ether. This reaction may be carried out under pressure if necessary. The polymerised hydrocarbons obtained still contain a double bond and give low boiling fuels, suitable for internal combustion engines, on cracking. S. F. B.

50. Manufacture of Chlorohydrins. K. P. McElroy. U.S.P. 1,510,790.

Chlorohydrins are formed by the interaction of gaseous olefines and solutions containing hypochlorous acid which are prepared in such a manner that they contain no substances detrimental to the formation of chlorohydrins. Such a solution may be prepared by treating an aqueous solution with chlorine under such conditions that both hypochlorous acid and water vaporise and condense the vapours. S. F. B.

51. Condensation of Acetylene and Hydrogen Sulphide in Presence of Catalysts. H. C. Tomkinson. *J. Chem. Soc.*, 1924, **125**, 2264–2266.

The author has found that metallic sulphides catalyse the reaction between hydrogen sulphide and acetylene; it is, therefore, probable that Tschitschibabin's observation that metallic oxides catalyse this reaction was due to the conversion of the oxides into sulphides and that these were the actual catalysts. Ferric oxide at 300°–350° C. gives a condensation product containing acetaldehyde, 30–40 per cent. of thiophen and a high boiling residue containing homologues of thiophen. The results obtained when using a large number of other catalysts are given. S. F. B.

52. Condensation of Acetylene with Hydrogen Sulphide in Presence of Aluminium Oxide. A. E. Tschitschibabin and O. S. Bagdassarjanz. (*J. prakt. Chem.*, 1924 (ii.), **108**, 200–208).

The passage of a mixture of acetylene (2 vols.) and hydrogen sulphide (1 vol.) over aluminium oxide heated to 425–450°, leads to the formation of a liquid condensation product. This has been found to consist of thiophen (40 per cent.), together with 2- and 3-ethylthiophen, mercaptans, unsaturated hydrocarbons and a high boiling residue. The activity of the catalyst rapidly decreases and in consequence there is a fall in the specific gravity of the liquid condensation product. S. F. B.

53. Thermal Decomposition of Methane. R. C. Cantelo. *J. Phys. Chem.*, 1924, **28**, 1036–1048.

Thermal decomposition of methane may lead to the formation of carbon, ethylene or acetylene and free hydrogen, but the equilibrium constants for

the action, calculated from Nernst's formula, show that only negligible quantities of ethylene and acetylene are to be expected, carbon and hydrogen being the main products. The effect of catalysts such as lime, bone-black, copper-copper oxide, nickel-nickel oxide, manganese dioxide and silica gel on this decomposition has been studied at various temperatures, and it has been found that most of them exert some influence on the reaction. The nickel-nickel oxide catalyst exerts a considerable influence, almost complete equilibrium being obtained at 780°. The importance of this decomposition in the manufacture of carbon black from natural gas is emphasised and the existing methods reviewed. Most of these rely on the decomposition occurring at temperatures over 1200°, but theoretical considerations point to the use of a lower temperature such as that employed in the nickel-nickel oxide catalytic decomposition. At present the chief difficulty in this method is to prevent the deposition of the carbon formed on the catalyst.

S. F. B.

54. Catalytic Dehydration of Alcohols. A. B. Brown and E. E. Reid. *J. Phys. Chem.*, 1924, **28**, 1077–1081.

The authors have investigated the catalytic dehydration of ethyl and butyl alcohols at temperatures between 220° and 500° using thoria, alumina, the blue oxide of tungsten and silica gel as catalysts.

Ethyl alcohol gives ethane and methane, and butyl alcohol, butane and propane, the quantities of ethane and butane being particularly high when silica gel is used as a catalyst. Butyl alcohol was decomposed at a much lower temperature than ethyl alcohol in all the experiments carried out. The blue oxide of tungsten and alumina proved to be the best catalysts for the formation of ethylene and butylene, both on account of the high yields obtained and the absence of side reactions. S. F. B.

55. Improvements Relating to the Manufacture of Acetic Acid, Acetaldehyde, or Acetone or Mixtures containing the Same. Henry Dreyfus. E.P. 226,248.

Acetic acid, acetaldehyde and acetone or mixtures containing these, may be prepared by passing methane mixed with one or both of the oxides of carbon over suitable catalysts under pressure at temperatures not above 500° C. The hydrogenation catalysts such as nickel, cobalt, iron, etc., or carbonates of metals which tend to decompose between 100° and 500° into metallic oxides and carbon dioxide, form suitable catalysts. S. F. B.

Natural Gas,

56. Comparative Tests in Natural Gas Scrubbing. G. Weissenberger. *Petroleum*, 1924, **20**, 1817–1825.

To ascertain the advantages of the Brégeat process over ordinary scrubbing, tests of absorption were made on two identical sets of Brégeat apparatus and one ordinary distillation set. The towers were 5 m. high and 30 cm. in diam. The gas was admitted through a pressure regulator. The distillation plant consisted of a still with heating and cooling coils, a packed column and a condenser. Means were provided for measuring the gas and ascertaining its temperature and pressure at various points in the system, and for measuring the flow of the absorption fluid. The resistance offered to the gas by the absorption liquid was thus ascertainable. The gas was analysed before entering the apparatus and on emerging from it. The gasoline content of the gas was ascertained by absorption with activated

charcoal or with tetralin, which absorbs the gasoline and gives it up again at temperatures from 30° C. to 135° C. Steam was found to be unsuitable for driving the gasoline off the charcoal, and it was moistened with tetralin and heated. A certain amount of water is absorbed and given off with the gasoline. In trials the Brégeat absorption fluid gave the following results: 64·98 cb. m. gas put through, expenditure of absorption fluid per hour 27·1 reclaimed gasoline, 3600 g. of 0·705 sp. gr. A trial with spindle oil as absorbent gave: 68·10 cb. m. gas put through; absorption fluid per hour 35·1; reclaimed gasoline 2208 g. of sp. gr. 0·710. The absorption with Brégeat fluid was found to be complete, whereas the gas from the spindle oil absorption contained gasoline, especially the lighter fraction. Violent bumping accompanied the distillation of the spindle oil, but the distillation of the Brégeat absorption fluid was steady. The absorption with Brégeat fluid was 42 per cent. higher than with gas oil, which gave similar comparative results to spindle oil. The gasoline reclaimed from spindle oil had a slight foreign odour, and that from gas oil a strong unpleasant odour, owing to the oil distilling over with the gasoline. The spindle and gas oils had a greater tendency to extract moisture from the gas than the Brégeat fluid.

H. M.

57. An Improved Method of and Apparatus for Separating Gasolene from Natural or Hydrocarbon Vapours. J. W. Chadwick. E.P. 224,688 of Oct. 18, 1923.

Natural gas or hydrocarbon vapour containing petrol is passed up a tower containing baffles in which it meets a downwardly flowing stream of oil. The oil is sprayed into the top of the tower. Above the spray a slotted cone, arranged to give a whirling motion to the gas, is fitted for the purpose of removing fine particles of oil. The petrol containing oil is passed through a heating tube to a still where the final distillation takes place. The gas-burner heating the still is controlled by a device operated by the oil stream. Vapours leaving the still pass up an air-jacketed column surmounted by a damper which is automatically raised or lowered as the temperature at the top of the column varies. After leaving the column the petrol vapours are passed to a condenser. The residual oil from the still is pumped through a heat-exchanger and cooling coil to the top of the absorbing tower.

T. A. S.

58. Process and Apparatus for Recovering Gasoline from Natural Gas. L. Wallerstein. Assr. to Gasoline Recovery Corpn. U.S.P. 1,516,166. Nov. 18, 1924. (Appl., April 30, 1919.)

Natural gas is brought into contact with a shower of absorbent carbon whereby the gasoline is adsorbed. The carbon is then submitted to a distillation process to vaporise the gasoline which is then condensed.

T. A. S.

Lubricating Oils.

59. The Distillation of Oil with Inert Gases. L. Gurwitsch and B. Kaminer. *Brennstoffchemie*, 1924, **5**, 322–323.

The authors investigated the use of inert gases such as oil gas and chimney gases for the distillation of lubricating oil fractions, compared with ordinary steam distillation. The steam was superheated to 250°, the oil gas and chimney gases were used cold. They observed that the substitution of steam by oil gas gives distillation products of higher specific weight, flash point and viscosity. They conclude that there is less decomposition. Unlike oil gas, the chimney gases had no protecting influences. The percentage

of acid in the distillates (calculated as SO_3) is less with the use of oil gas and of chimney gases:

Distillation with	% SO_3 in the distillates. I.	II.	III.
Steam	0·261	0·151	0·080
Oil gas	0·196	0·034	0·024
Chimney gases with 2% O_2	0·200	0·032	—
Chimney gases with 3·4% O_2	0·198	0·031	—
Chimney gases with 6·0% O_2	0·200	0·052	—

Explanations of these remarkable facts are not given, but the authors are continuing their investigations.

H. I. W.

60. More Data on Dilution Test. John B. Rathburn. *Pet. Age*, 14, 15, 54. Dec. 15, 1924.

The crank case of a motor car engine was drained and filled with fresh lubricating oil. The horse power output at the rear wheels was then determined at different speeds by a dynamometer (Test No. 1). The car was then run under average driving conditions without any adjustment or additions of oil to the crankcase being made and it was brought back to the dynamometer at intervals. The horse power output was considerably greater, particularly at high speeds, after the car had been driven 291 miles (Test No. 2.) than immediately after fresh oil had been put in (Test No. 1). Some slight falling off in power was observed in Tests 3, 4 and 5 after 561, 615 and 1465 miles respectively, but in all cases except at a speed of 14·3 m.p.h. in Tests Nos. 3 and 4, the power output of the engine was greater than in Test No. 1. The increase amounting to several h.p. at speeds of approximately 30—50 m.p.h. Leakage of gas past the pistons decreased markedly during the trial and is recorded as 785 cu. ins. in Test No. 1, and 428 cu. ins. in Test No. 5.

R. W. L. C.

61. Transformer Oil. *Asea-Journal.* Pub. by Swedish General Electric Co., 5, Chancery Lane, E.C. 2. Nov. Dec., 1924, p. 123.

The results of studies on the effect of the electric field and on the influence of temperature on the stability of transformer oils are given.

The oil under test was maintained at 90° for 6 months in six cylindrical porcelain pots in which were placed iron spirals braced with copper wire. The outsides of the pots were coated with tinfoil connected to earth. The pots were covered to exclude dust, but not to prevent access of air. In four of the pots a voltage 25 KV was continually applied between the spiral and the tinfoil coating. No electric field was applied to the other two pots. At the termination of the experiment analysis gave the following results:

	Sludge.	Kissling tar value.	Acidity. Oil.	Sludge.
	%	%	%	%
Without electric field	1·1	1·84	4·9	36·4
With electric field	2·54	2·45	0·98	98·8

The results of a number of "life" tests on four oils are given in which the time taken to produce turbidity (commencement of sludging) at 70; 90; 105; 120 and 150° C. was determined.

A new method for testing the stability of transformer oils is described. The oil maintained at 100° C. and is under the influence of an electric field of 10 K.V. per cm. while oxygen at the rate of 1 litre per hour is bubbled through the oil. 100 hours is suggested for duration of the test.

R. W. L. C.

62. MONTAN WAX. *Chem. Trade Jour.*, 76, 3.

The sources, methods of purification, properties, chemical composition and uses of Montan Wax are dealt with in detail.

R. W. L. C.

CRACKING.

63. SMITH'S BLUFF PLANT BUILT IN UNITS. Grady Triplett. *Ref. & Nat. Gas*, 3, 11.

This plant has been designed to make gasoline and fuel from Mexia Crude, with a possible yield of about 70 per cent. of motor fuel.

The unit system is carried throughout the refinery, tube stills, cracking stills, redistillation plant, water pumping station, oil pumps, warehouse, laboratory and workshops, etc., are all separate units in buildings of uniform design.

The principle refining units consist of three Foster tube stills of 5,000 barrel capacity each, 26 cross cracking units, eight Standard Shell re-run stills and five 1,000 barrel washers. Crude oil is heated to 400° C. in the tube stills thus vaporising about 90 per cent. The vapours pass through towers and the fuel is separated while the vapours pass to the south-western condensing sections and reach the receiving house in the form of gasoline, benzine, kerosene and gas oil.

The small amount of gasoline is sent for treatment. The kerosene and gas oil is pumped to the cross cracking units for conversion into benzine and fuel oil. These are mixed with the benzine and fuel from the tube stills. The benzine from both processes is redistilled after washing and the gasoline produced is sweetened by a finishing treatment.

The boiler plant consists of four Geary tube boilers, each of 5,000 horse power, to work at 160 lbs. pressure, with Foster super heaters to give 100° F. superheat when the boilers are working at 150 per cent. of rating.

Finished oils are delivered through a central pump house containing direct driven centrifugal pumps of 3 in. and 4 in. dimensions. The driving shaft passes through a fire wall which separates pumps from motors as a precaution against fire.

All power for the refinery is electric and a variable speed A.C. motor is used for driving the pumps which charge the tube stills and cross units. This motor has a speed adjustment of fine and uniform graduation, without waste of power from full to one-third speed.

R. P.

64. FACTS AND FAKES AMONG CRACKING PROCESSES. DEVELOPING MODERN EQUIPMENT OF CRACKING PETROLEUM. WHAT ABOUT THE FUTURE OF THE CRACKING PROCESS? By R. H. Brownlee. *Chem. & Met. Eng.*, 31. Nos. 20, 21 and 22.

These three contributions form a complete paper on the history and development of cracking. Since 1912 when the first real commercial cracking plant was constructed an amazing development in cracking processes has taken place resulting, during last year, in the enormous production of 2,000 million gallons, which is equal to more than 25 per cent. of the total output of gasoline.

The author describes some of the fake processes put forward to catch the imagination (and money) of the uninitiated. He indicates what is meant by the term cracking. He submits that there is no basic patent in so far as existing heat and pressure processes are concerned, as there is only one basic process and that was invented years before there was any demand for gasoline. All due credit, however, is due to those who have invented

an ingenious apparatus for carrying out the process. They deserve the credit which they have received for developing wonderful apparatus, but not for a process which on account of previous disclosure made it public property. The result of the pending U.S. Government suit against many of the oil companies will be of great interest to the industry. Notwithstanding all present claims it is an outstanding fact that the Burton plant was the first to produce gasoline in commercial quantity. Burton's early difficulties, his first commercial unit, and improvements and modifications are detailed, followed by descriptions of the modern processes of Cross, Dubbs, Fleming, Isom, Holmes-Manley, Carleton Ellis, Hall, Rittman, Greenstreet, Forward and the catalytic processes of Ramage, Gray and McAfee.

When comparing yields, it should be ascertained exactly how the yield of gasoline from any particular plant is calculated and it should be kept in mind that all processes are not suitable for every refinery.

R. P.

66. Cracking gets Big Boom. *Ptr. Age*, 1924, 14, 50.

In 1913 T. T. Gray discovered that gasoline, especially cracked gasoline, after passage through fullers earth in the form of vapour lost its tendency to develop colour and deposit gum. This method of refining has now been converted to a practical scale. The vapours from the still pass up a wide column within which is a smaller column containing the fullers earth of 60—90 mesh resting on a perforated false bottom. This smaller column is open at the top, whilst the lower end is closed but provided with two run off pipes at different levels which project through the walls of the outer column. The higher run off leads refined vapours to a condenser and the lower one, which is provided with a U bend trap, is for removing the heavy polymerised compounds coming from the fullers earth. The crude vapours in the large column pass down through the fullers earth where the polymerising action converts diolefines to high boiling, red, gummy materials which condense and are run off through the U bend. The refined vapour issues from the condenser as a water white liquid which has lost its tendency to gum or revert in colour, this result being due to the removal of diolefines which are supposed to be the only compounds that cause gumming. All other valuable compounds are untouched and remain in the spirit, refining losses being thus reduced to about 1 per cent. in place of 3—5 per cent. in the case of acid washing. Sulphuric acid, moreover, polymerises some unsaturated hydrocarbons to compounds of high boiling point which remain in the spirit, necessitating refractionation to get a satisfactory end point. In the Gray process high boiling polymers condense in the fuller's earth and are removed through the lower run off and do not contaminate the refined vapour. Moreover the red polymerised liquor can be redistilled to recover any low boiling portions which may have been carried down without any fear of producing a coloured distillate. It is claimed that from 100 to 500 barrels of gasoline can be refined by one ton of fuller's earth.

F. G. P. R.

67. Operating a Modern Cracking Plant. Jacque C. Morrell. *Chem. & Met. Eng.*, 31, 1006.

This is an article on the functions and results of the Dubbs cracking process.

The principles of the plant are detailed and the chief points of operation are specified.

The process has shown some remarkable results with a great variety of oils.

Four units giving a total of 250,000 barrels produced more than 40 per cent. gasoline from gas oil.

From the consecutive cracking of 20,000 barrels of a ·900 specific gravity. Mid continental fuel oil 41·5 per cent. of gasoline was produced.

Wax distillate ·856 specific gravity was cracked to the extent of 35,000 barrels yielding 42 per cent. gasoline.

Fuel oil and gas oil producing no residuum, *i.e.*, run to gas and distillate, produced 47·5 per cent. gasoline, 19,000 barrels being cracked consecutively.

Various types of oil from a heavy Panuco residue to Californian kerosene have been cracked successfully.

The presence of water if evenly distributed does not disturb the process.

The pressure distillate can be easily treated to obtain marketable gasoline. Details of treatment were published in *Chem. & Met.* 30—20 (1924).

Where hydrogen sulphide and other objectionable products are present it is advisable to precede and follow all chemical treatment by thorough water washing. The coke formed in the process, if properly handled is firm, dry and porous with low ash content and a calorific value of between 15,000 and 16,000 B.T.U. per lb.

R. P.

68. Vapour Phase Refining of Gasoline. D. M. Liddell. *Chem. & Met. Eng.*, 1924, 31, 975—976.

While many straight-run gasolines can be used as motor fuel without further refining, most gasolines produced by cracking turn brown on standing, have a disagreeable odour, and deposit gum. Instead of acid, soda and water washing formerly practiced the gasoline is submitted to the catalytic action of fuller's earth in a tower while in the state of vapour. The gasoline is refined with a loss of only ¼—½ per cent. against 4—5 per cent. in acid refining. The diolefines condense out as a yellow to orange-red liquid, which may be returned to the stills. The polymer fraction, when isolated, has some drying properties, and may find other uses. 100—400 barrels of gasoline may be refined by a ton of Fuller's earth. The earth, which turns black in the process, may be regenerated by heating. With the apparatus operating in conjunction with pressure stills, there is a saving of 7 cents. per barrel in operating costs; an increase of 8 per cent. in gasoline produced, and 2 per cent. more of heavy residual hydrocarbons to go back to the stills. The process is applicable to the refining of kerosene, and sulphur-containing kerosenes refined by this method give good burning tests.

H. M.

69. Rapid Improvement in Cracking Processes. *Ptr. Times*, 13, 314.

A short general article with particular reference to the Blumner Process. The process is carried out in a welded steel autoclave at about 450 C. and forty atmospheres pressure. The oil is heated to cracking temperature by means of molten lead. The lead is apparently heated to the required temperature outside the autoclave and then introduced into direct contact with the oil. In this manner no overheating will take place. The apparatus is guaranteed not to produce coke and is said to be continuous in operation. The quality of the spirit produced is stated to be high when compared with that from other cracking processes and can be easily refined.

R. P.

70. Rapid Improvement in Cracking Processes. *Petr. Times*, 13, 315.

Correspondents point out that by cracking heavy oils the carbon hydrogen ratio is changed and that of necessity carbon must be eliminated in the form of coke.

R. P.

71. Improved Process for Converting High Boiling Hydrocarbons into Hydrocarbons of Lower Boiling Points. Harold Ridgeway Berry. E.P., 202,317.

The process comprises subjection of hydrocarbons under pressure to constantly increasing temperatures sufficient to produce molecular instability and by intimate contact with hydrogen to prevent cracking, by effecting hydrogenation, and operating in such a way that the entire mass of oil is converted into light products.

The apparatus consists of a heater, a generator, a cooler and a gas separator, with auxiliary plant for dealing with the raw materials and products.

Hydrogen containing gases are supplied to the heater wherein the temperature is raised above the degree of heat required for vaporising the heavy hydrocarbons. Water is added to the gases at a convenient point in the heater. The heated gases are discharged into the bottom of the generator and ascend against the downward flowing oil. The generator is specially constructed to form films of oil so that intimate contact between gas and oil is obtained.

Introducing heated gas at the bottom and comparatively cold oil at the top of the generator results in a gradual increase in the temperature of the oil and a gradual decrease in the temperature of the gases.

Each component of the oil mass vaporises successively. The pressure maintained should be sufficient to obtain the temperature of molecular instability so that additional hydrogen may be assimilated.

The temperature of non-stability is the critical temperature for hydrogen absorption and molecular adjustment, the most favourable condition for reduction of gravity. Carried to excess however, with violent and ill-judged heating, the atomic constituents break asunder with the formation of low gravity compounds and elementary carbon.

A curve of the relationship between boiling point and temperature of molecular instability is shown for the paraffin series of compounds. The curves cross between $C_{15}H_{32}$ and $C_{16}H_{34}$. All lighter compounds have lower boiling points than temperature of instability whereas above this line the temperature of instability is below the boiling point.

The method of arriving at the temperature and pressure requirements is therefore to determine the boiling range of the oil under treatment (the hydrogenation of the lower boiling constituents is not contemplated). The pressure condition is, therefore, established by that pressure required to raise the boiling point of the lightest constituent of the oil under treatment to its temperature of instability.

The temperature condition is established by ascertaining the new boiling point of the heaviest constituent under the established pressure condition.

When these conditions are established each respective compound of the mixture will vaporise in a condition of non-stability enabling molecular readjustment and hydrogenation to take place. The top of the generator is maintained at such a temperature that only light products escape.

Any hydrogen containing gas may be used.

Tables are given showing physical properties, temperatures of non-stability and pressure required to raise the boiling point to that temperature, of the paraffin series of hydrocarbons.

R. P.

72. Still (Cracking). Max. F. de Bajligethy. U.S. Pat., 1,521,601 of 1925.

The invention of a cracking still with dephlegmating domes of special construction. The domes are cylindrical, with inverted conical shaped perforated baffles secured to the dome at their outer edges and secured at

their inner edges to a flue which passes down the centre of the dome and is connected to a longitudinal pipe immersed in the oil within the still. From this pipe the vapours pass out into a condenser.

In the process the oil is distilled and the vapours pass up the dephlegmator through the baffle-plates, which are kept cool by radiating plates arranged outside the dome. Any condensed oil flows back to the still and the vapours pass into the central flue at the top of the dome, proceed downwards into the submerged horizontal pipe which remains at still temperature, and thence by the outlet to the condenser.

R. P.

73. Process for Treating Oils. Carbon P. Dubbs. U.S. Pat., 1,522,425, of 1925.

A patent has been granted by the U.S. Patent Office to Mr. Dubbs for his already well-known process (and plant) which consists of pumping the oil through a cracking coil and discharging into a large cylindrical expansion chamber where coke deposits. The vapours pass into a dephlegmator which condenses heavy oils and allows only light fractions to pass over to the condenser. The oil condensed in the dephlegmator runs down the reflux leg into the feed for further heat treatment. The raw oil, or part of it, may be fed into the dephlegmator in order to preheat it and serve to maintain a proper temperature in the dephlegmator.

The process is usually operated under a pressure of about 120 lbs. per square inch and the temperature is about 480° C. at the outlet of the heating coil. These conditions may be altered when necessary.

R. P.

74. Cracking Apparatus. Elmer C. Blasdell. U.S. Pat., 1,518,555.

The apparatus consists of connected units of stills and dephlegmating towers, each unit having a still and three or more dephlegmating towers connected in series. Valves are placed so that stills or towers may be disconnected singly or in units for cleaning or repairs.

The oil under treatment is heated in the first still and passes into a chamber at the bottom of the first tower from which it overflows into the chamber of the second tower and so through the series while the vapours only pass up the tower to the outlet at top. From the last tower of the first unit the oil flows into the still of the second unit where the process is repeated. The towers are cooled externally by a water spray.

R. P.

75. Improvements in connection with Pyrogenic Transformation of Acetylene or Gasoline Mixtures containing Acetylene. Ferdinand Gros. Brit. Pat., 211,461.

In the conversion of acetylene into aromatic compounds by the action of heat, pieces of electrode carbon in the form of rings are used to fill the tubes, which are internally heated by the passage of an electric current. The temperature used is about 550° C. and only a portion of the gas is transformed at each passage through the apparatus, A heat exchanger is used to heat the entering gases and is composed of an inner coil through which the out-going gas passes and an outer coil for the in-coming gas. Both are made of porcelain, silica or other refractory material.

R. P.

76. Process of Treating Petroleum Products. Carlton Ellis. Assr. Ellis-Foster Co. U.S. Pat., 1,516,720, of Nov. 25, 1924. (Appl. Aug. 22, 1924.)

Oil, heavier than gasoline is cracked, for the purpose of making motor spirit. The operation is carried out at relatively high temperatures and

pressures so that a mixture of aliphatic and aromatic bodies is formed. Part of the lighter products are mixed with insufficient air for complete combustion and passed over catalysts at 300—400° whereby fatty acids and other oxidation products are formed. T. A. S.

77. PRODUCING AROMATIC SUBSTANCES FROM PETROLEUM. H. W. Weber. Assr. to Ellis-Foster Co. U.S. Pat., 1,516,756, of Nov. 25, 1924. (Appl. May 12, 1922.)

Petroleum oils are cracked at 540—650° and substantially the whole of the cracked products is submitted to oxidising conditions. Particularly the aromatic bodies are oxidised, the oxidation being carried out in the presence of a heated catalyst. T. A. S.

78. CRACKING AND OXIDISING PETROLEUM OIL TO MAKE GASOLINE AND USEFUL PRODUCTS OF OXIDATION. C. Ellis. U.S. Pat., 1,517,968 of Dec. 2, 1924. (Appl. Jan. 3, 1922.)

Oil boiling below 300° is desulphurised and heated to cracking temperature. Air is mixed with cracked vapours and the mixture heated to below a red heat whereby partial oxidation takes place. The quantity of air used is less than that required for complete oxidation of the hydrocarbons.
T. A. S.

GEOLOGICAL.

79. WHERE OIL DEPOSITS OCCUR IN AUSTRALASIA. Capt. E. de Hautpick. *Mining J.* **147**, 4653–4659.

The whole series of articles may be taken as an interesting and instructive a tempt to deal with a matter which in course of time will certainly confront e oil-geologist, when accessible information is lacking from ordinary survey work and pure reasoning is the only weapon left him for his researches. The "topography of Australasia" is the first subject dealt with, followed by an account of the geological growth of Australia, and "the Building of Australasia."

"The Extinct Volcanoes of South Australia" form the subject of another article, and finally he treats of "the Deformation of Earth's Crust," since he considers the most important question to be elucidated in the course of the work of exploration for oil in a new region is the sum total of all the earth's movements and disturbances in rocks after their disposition—so-called diastrophism.

Finally, in the last article (Dec. 6, 1924), he reviews "Australian Geology in relation to Oil Possibilities."

Since the Cambrian era he notes at least two north-easterly trending troughs of sedimentary material. The western or Tasmanian geo-syncline, almost wholly Palæozoic, and now partly elevated into the plains and mountains of Eastern Australia, the rest sunk deep into the Tasman sea. The eastern trough, also appearing early in the Palæozoic era, maintained itself through the Mesozoic and even into Pliocene time. This is the New Zealand geo-syncline—narrower, but longer than the former. The southern part forms now the mountains of New Zealand, whilst the longer northern part has subsided to a depth of about 9000 ft., forming a submerged plateau, upon which stand the volcanic isles of the Kermadecs and the Tongas. The main plateaux of Western Australia have probably stood above sea-level since the earliest geological times. Australasia and Asia, according to palæography, were in complete connection till the close of the Mesozoic period, when the various portions of Australasia ceased to have any striking unity of geological history. The region was fragmented, and subsidence blocked

it out into the geographical elements now visible. These had very diverse histories during the Tertiary period. Great areal subsidence occurred, evidenced by the present Molucca-Banda-Arufura seas, varying in depth from 4650 ft. to 21,000 ft. The Moluccas appear to be geologically and structurally a part of New Guinea, and are therefore remnants of the foundered Australasian continent. The absence of folding movements in later geological formations in Australia must have some fundamental causes; possibly it is the result of a thick shell forming this outer portion of the globe, where the geo-dynamic stresses could not exceed the strength of materials. The author deduces that Australia, by want of folding processes during suitable periods, was unable in an ordinary way to squeeze and store oil where it was present in a disseminated state. He therefore looks to the intrusions of igneous rocks (as in Mexico and Texas and other countries where rich oil fields occur in Tertiary basins associated with such igneous intrusions). Simple displacement due to the ascent of one large mass would cause indirect pressure on all the deeply buried rocks within a wide area.

The so-called "domes" from the drilling data of Texas oil-pools are really subterranean plateaux often a hundred acres or more in extent on the top, and relatively flat, with very steep, sloping and irregular sides. His final "conclusion" is that prospecting for oil in Australia must be centred in Tertiary marine sedimentary basins, rich in vegetable remains and associated with the intrusions of igneous deep-seated rocks, as they are in the ancient Murray estuary (South Australia) and may be in South Gippsland (Victoria), etc. It would not be a geological surprise to meet oil in the coastal Tertiary margins of North Tasmania, or the Tertiary marine sedimentaries of New Guinea.

New Zealand he considers must contain valuable oil deposits in some places. All work up to the present in search of oil for the whole of Australasia, especially for New Guinea, so little known, may be considered unsatisfactory. The oil-pools to be found in Australia should be of a peculiar type of local uplift, and may be buried at some depth without any topographic feature in flat coastal plains. New instrumental methods should be made use of, such as the *Torsional Balance*. Changes of gravity may be thus determined with accuracy, and in level country coastal plains give an idea of the formation of anticlines, domes, and often faults. J. E. M. H.

80. The Coorong Oil Co. of Australia. *Petr. Times*, Oct. 25, 1924; conclusion of paper in Oct. 18 issue.

The fact that the oil distilled from Coorongite is entirely unsaponifiable testifies to the mineral origin of this body, which the author regards as an oxidised product of hydrocarbons which became mixed with the fungi, algæ, diatoms and all kinds of rubbish, organic and inorganic, which were locally present. Previous to its formation an oil seepage took place, such as the author observed not far from the mouth of Salt Creek. He saw Coorongite formed from oil films, which first formed a foam which was mixed up with rubbish and gradually dried up. Thus he entirely discards its vegetable origin and infers that much crude oil must have seeped up to destroy the vegetable growths in the Coorong district as already described. His conclusions and recommendations are:—

(1) That the strata in the coastal division of the properties give evidence of containing oil.

(2) There are deposits of coal of sapropelitic types; and these same deposits in depth are the typical mother-rocks of oil.

(3) The presence of Coorongite on a large scale and the oil seepages found in this country are further evidences of oil, in the regions where they are found, favourable underground structure being present.

(4) The area has a suitable thickness of sedimentary rocks to form an oil-basin, with a good cover.

(5) The rocks are saturated with salt water, and gypsum deposits are present.

(6) The southern part of the property is a recipient for all underground artesian waters in the depressed zones, which movement is the cause of oil storage in commercial pools.

(7) There is suitable type of structural features for the accumulation of oil in commercial pools, by faulting.

Different sites are suggested for drilling; deep-drilling to be accompanied by diamond drilling. The company's bases are located in the basin of the ancient Murray River, which has for ages past been the grave of buried organic matter from three states of the Commonwealth, and should present the largest storage of this matter. J. E. M. H.

81. La recherche des gisements de Petrole (The Search for Petroleum). M. Georges-A. Richoux. *La Rev. Pétrolifère*, **19**, 110, Jan. 10, 1925.

The large areas over which geological researches often have to be carried out is instanced by the Royal-Dutch Shell concessions of Maracaïbo in Venezuela, which cover over 30,000 sq. kilometres (10,800 sq. miles).

The author then passes to *the origin of petroleum*. He accepts the *sapropelitic* origins, and notes that the frequent occurrence of petroleum with mineral substances such as rock-salt, gypsum, is evidently due to similar conditions of deposition. The reduction of the sulphates by the organic matter accounts for the sulphurous springs so often found in the neighbourhood of oil, as well as the sulphur in crude oil.

The migration of petroleum.—The petroleum having its mother-rock may thus reach porous reservoirs of sand, grit, fissured limestone, etc., its progress being arrested by clays, marls, compact cherts, whilst the minerals that have accompanied or followed it serve to close the base. Thus the oil may may be separated from its place of origin by a considerable thickness of sediments. This place of origin is not usually reached in drilling, and remains unknown in most cases. During the last decade some of these "mother-rocks" of oil have been determined with certain exactness: for instance, there are the Diatomaceous schists of Monterey in the Californian fields, the lower Cretaceous beds of La Villeta in the Magdalena and Rio de Oro districts of Colombia, also of the Maracaïbo in Venezuela, at present one of the most important reservoirs in the world.

The paper is to be continued. J. E. M. H.

82. La recherche des gisements de Petrole (Petroleum Research). M. Georges-A. Richoux. *La Rev. Ptérolifère*, **19**, 111, Jan. 19, 1925; conclusion of article.

Observing that almost all important oil fields up to date have been located in the first place by surface indications, except the Rivadaria, discovered in 1903 in sinking a well for water, some of these signs of oil are briefly reviewed.

The entry of the geologist into the exploratory work is next noticed, with the hope that fewer dry wells, especially in rich districts, should be initiated. The "wild-cat" ventures are also alluded to, as an instance of which the U.S.A. figures for 1923 are given, with 698 dry wells out of 859 (*Oil and Gas J.*, Nov. 20, 1924).

The main duties of the geologist are briefly described, and the paper concludes with "Methods of Drilling"—a passing tribute being paid to the utility in certain cases of the diamond drill. J. E. M. H.

83. Etude sur les Exploitations Petrolifères de Pechelbronn (A Study of the Working of Petroleum at Pechelbronn). *La Rev. des Combustibles Liquides*, Nov., 1924.

Situation of the deposits.—These are situated about 18 miles north of Strasbourg, Alsace, and their course runs nearly parallel to the Rhine, which is about 6 miles to the east of the concessions. They measure some 24 miles in length, with a width of 9 miles, and include some 30 agglomerations, the most important of which is at Haguenau.

Nature of the deposits.—These consist of sands impregnated with oil, which can be classified into (*a*) the upper sands, lenticular and enclosing heavy oil of densities 0·93–0·97, with slight gas pressure, and which naturally were the earliest to be exploited; and (*b*) the lower sands occurring at depths varying from 150 to 60 metres, which may attain a width of 200 metres, and are some 1000 metres in length, with thickness varying from 2 to 3 metres. The mean density of the oil is 0·880, and it holds gas under high pressure. Drilling is employed for these in the first place, and "gushers" occur which differ from those generally met with in that their discharge is feebler and is intermittent. In 1919 at 435 metres depth a gusher occurred active only 10 minutes hourly, but yielding an average of 60 tons of oil per 24 hours.

Pits and galleries.—This mode of extraction is peculiar to Pechelbronn. The method resembles that in coal-mining, and has long been applied to the shallow lenticular beds which are nearly without gas. It has been applied since 1917 to the deeper sands, also when pumping ceases to be effective.

From the spring of 1917 to that of 1924 the oil got by pits and galleries was 145,629 tons. Five pits are actually active, with some 21 metres of subterranean galleries draining an area of 12 to 15 hectares (30–37 English acres). The whole area capable of being worked out is some 110 English acres.

Treatment.—The oils are treated on the spot. Since the Armistice an up-to-date refinery has been put up, with continuous distillation, and the use of vacuum and superheated steam injections. This was finished in 1920, and consists of 50 stills each of 28 to 30 tons capacity, that permit the treatment of 70,000 tons of crude annually. J. E. M. H.

84. Note on the Origin of Petroleum. Frederick H. Lahee. *Bull. Amer. Assoc. Petr. Geol.*, **8**, 5, 669–672, Sept.-Oct., 1924.

Calcareous material containing casts of Ammonite shells has been photographed and shows that fillings of a solid, glossy-black, brittle petroleum closely resembling asphalt fill the chambers of the original shells. The specimen photographed was collected from an exposure of "oil shale" on the east side of the Andes Range, in Mendoza province, Argentina.

This "Ammonite shale" formation, which besides Ammonites carries a wealth of impressions and casts of brachiopods. No plant remains were discovered. The formation is of Upper Jurassic (Portland) age. It is several hundred feet thick, a dark grey to black strongly petroliferous shale, passing above into a series of alternating thin-bedded bituminous limestones and shales.

Glistening petroleum films are common on the outer surfaces of these and other shells, especially on round imprints of the abundant Discina found in some horizons.

The Ammonite shale is one formation within a great group of formations several thousand feet in thickness. These are rather strongly folded, dips range up to 90°, but are generally between 20° and 60°.

Line seepages of asphalt and dikes of Rafaelite are known to be present at certain localities where the ammonite shale is below the surface. These are always associated with faults or fracture zones, but never with simple unbroken exposures of sandstones. Sandstone beds near the shale stratigraphically and structurally in an attitude favourable for the reception of oil, if any migrated widely in the region, are free from evidences of having ever contained petroleum.

The conclusions follow (1) that the ammonite shale (including its briny Facies) is the principal source rock of the oil seepages and rafaelite veins, being the only petroliferous formation in the region, the seepages, etc., only occurring in the area underlain by this shale, and being absent where it has been removed by erosion; (2) the petroleum has originated within the ammonite shale, if not generally throughout the rock at least locally in or beside fossil shells and impressions; (3) in this particular formation petroleum has formed from animal remains; (4) the petroleum thus originated has migated only where the source rock has been fractured; (5) possibly the heat and pressure accompanying faulting and volcanic intrusion facilitated the local development of this petroleum. J. E. M. H.

85. Tabasco Geology, in relation to Petroleum. Aspectos Geologicos Generales de la Region de Tabasco, en su Relacion con la Existencia de Petroleo Boletin del Petroleo (Mexico). May, 1924, **17**, No. 5. Wm. F. Jones.

The Cretaceous limestones of the Tabasco region correspond with those of Tampico, and Mexico, generally speaking, is composed of them, as regards its chief mountains and plains.

A low coastal plain (unconformable with the Cretaceous) of Tertiary sands, claystones, marls, stretches with varying width from Texas across Tampico and the Medial region of Campeche to the extreme east of the "Laguna de Terminos" in that state. It is very wide about Tampico and Tabasco, and is interrupted north and south of Vera Cruz by Tertiary eruptives.

A second series consisting of Tertiary limestones mainly lies upon the above series, the Cretaceous limestone forming the base of the whole series. These Tertiaries forming some well-defined folds to the west of Tabasco are but slightly dislocated by a moderate uplift to the north of the region, but to the south they reach a considerable altitude. A fault (east and west) separates these two regions, dividing the Sierra Madre (south) from the coastal plains of Tabasco and Campeche (north).

The elevated portions have been largely denuded, exposing the Cretaceous underneath. Petroleum exists in this region, principally in the Cretaceous limestones which correspond with the zones of Tampico-Turpan-Tehuantepec more to the north. Oil has also been met with in the lower Tertiaries at different depths near Macuspana in Tabasco. This oil was very light and could be utilised in its natural state for internal-combustion engines. It may be commercially productive, though doubtless it proceeds from the Cretaceous. One of the Macuspana wells produced daily 750 barrels for some time, and other wells at slight depths have given a small production. The numerous asphalt deposits show that the petroleum closely resembles that of Tampico and other Mexican oils.

The petroleum in the Cretaceous must be contained in fracture-cavities or those produced by solution (perhaps sometimes by conversion of a part of the limestone into dolomite). The rock thus became cavernous, especially along the fracture zones, which bear no direct relation to the rock-folds.

In the Tampico and Turpan region this is likewise found to be the case. The localising of these fracture-zones in the subjacent Cretaceous of Tabasco-Campeche is more difficult than in the Tampico-Turpan region, where igneous

intrusions have served as guides. The chief zones of fracture will generally be parallel to the axes of folding of the limestone, although this is not invariably the case. J. E. M. H.

86. The Oil-fields of Peru. Señor O. V. Salomon (Consul-General in London). *Petr. Times*, **22**, 292, Jan. 10, 1925.

The author deprecates unfavourable criticism of future oil prospects due to the want of success round about Lake Titicaca, stating that it is commonly doubted in Peru whether oil exists in this region (12,000 ft. above sea-level), although it has been encountered at 8000 ft. The fact is that Peruvian oil is to be found principally on, and not above sea-level. Further exploitation and development of Peruvian oil is commended in view of its widespread existence, and the great prosperity of the companies engaged in the industry: 331,635 tons of oil were produced in 1915, whilst in 1923 no less than 844,371 tons was the yield.

The London and Pacific Petroleum Co. (the pioneer company) and the Zorritos and Lobitos are cited as thriving examples. The first named produced 5,000,000 barrels of the finest oil, valued at £5,000,000, last year, and it is expected that the yield this year will be 1,000,000 tons, valued at £9,000,000.

The oil is one of the finest in the world. It is light green, or sometimes brown-golden in colour, and ethereal, rich in volatile substances and in lubricants. Its base is asphaltic; sp. gr. 0·79–0·867. J. E. M. H.

87. Australian Oil Prospects. *Petr. World* **22**, 292, Jan. 10, 1925.

In the Northern Territory Dr. Wade has inspected the coast from the mouth of the Victoria River to the entrance of the Gulf of Carpentaria, landing at various points, making a voyage up the Daly River, and an inland traverse to the Roper River. He found no oil-seepages, and considers that drilling in these parts would be fruitless. This remark applies also to the northern portions of West Australia.

In the Fitzroy area of Western Australia he feels bound to abandon any idea of the Lower Carboniferous limestones as a possible source of oil in any considerable quantity.

The Price's creek area exhibits unsatisfactory structure, but the marginal portions on the Fitzroy were certainly the most favourable for oil-accumulation that Dr. Wade has yet examined in Australia. Three test-wells with heavy standard plant, capable of drilling to between 3000 and 4000 ft., would definitely solve the problem of paying oil in this area. Evidence was obtained at Price's Creek that oil had escaped either through or along a fault. J. E. M. H.

88. The Value of Micro-Fossils in Petroleum Exploration. Charles Schuchert. *Bull. Amer. Assoc. Petr. Geol.*, **8**, 5, 539–553, Sept.-Oct., 1924.

This paper deals with the value in sub-surface correlations of the fossils that may be obtained in oil-well drilling, and especially of the Foraminifera. That Foraminifera are no longer on trial as guide-fossils in underground correlation is evidenced by numbers of letters from various localities, which show clearly that most of the petroleum companies using minute fossils as stratigraphic guides—and this means mainly Foraminifera—are having splendid results. The kinds of whole fossils obtainable in deep well cuttings are next considered. As microscopic life is very frequently common in late Mesozoic and all of Cainozoic marine strata, it is naturally upon this micro-life that the geologist seeking petroleum is most dependent. The most abundant

representatives of this usable micro-life are Foraminifera, Ostracoda, and Bryozoa.

The Bryozoa, Ostracoda and Foraminifera are then considered more in detail. The former abound in the Gulf coastal areas east of Mississippi River; to the west Protozoans are almost lacking. They are specially useful in the more marine Eocene and Oligocene cuttings.

The Ostracoda are excellent guide fossils to limited portions of the marine Palæozoic formations. They are abundant in the well-cuttings of Texas.

As regards the Foraminifera, the large spaces have limited time-ranges and are used successfully in stratigraphic correlations by the palæontologists of the United States Geological Survey, and have long been used by European workers; they have little value in petroleum mining, being seldom found in well-cuttings.

The author notes here that it is temperature and other environmental conditions that control foraminiferal distribution, and not depth and pressure of the waters. It is the calcareous-shelled Foraminifera that are of value for correlation purposes. The procedure in the Houston laboratories is then stated.

It is from the Foraminifera that nearly all the present knowledge of the intricate sub-surface stratigraphy of the salt domes has been determined. Foraminifera are more common in calcareous rocks like limestones and marls than in aluminous muds or shales, and are least abundant in sands. In late Eocene and all of Oligocene time it is the rule to find an abundance of micro-fossils, because these strata are mostly calcareous in nature, the waters were then warmer also, causing a greater variety of species.

J. E. M. H.

89. Petroleum Deposits of Bulgaria (Bulgarieus Erdölschatze). *Allgem. Osterr. Chem. und Tech.-Zeit.*, **43**, (2), Jan. 15, 1925.

The most notable oil-zone is in the Pirdop valley in the centre of Bulgaria, south of the Carpathian chain, where asphalt and petroleum beds varying in thickness have been found. Many waters in this neighbourhood show oil-films. Usually the asphalt layers in this valley occur in clefts in the side-hills, and run north-west by south-east. At Rosesthal the beds belong to the Upper Tertiary (Miocene ?) and are covered by Pliocene sands, which are so eroded in some places as to expose the oil-impregnated rocks.

Three other zones lie from Provadia to the Black Sea on the Roumanian boundary near Maritzatal and Kostenitz. Here geological evidence is not yet complete, but there are many signs that the oil-sands are important.

J. E. M. H.

Fields.

90. The Design of Oil Fuel Pipe Lines. W. G. Watkins. *Engineering*, Vol. CXVII. Nos. 3076–7 and 8. Dec. 12, 19 and 26, 1924.

The article is in no sense a theoretical discussion, but is intended as a practical help to the designer and engineer, and consists of a series of notes based on experience and data collected from various sources, together with tables and diagrams for facilitating calculations, with examples of their application.

The first portion (in No. 3076) explains briefly the main considerations underlying the problem of design, with notes on pipes and laying, valves, pumps, filters and other fittings, heating and emptying arrangements, and generally indicates points to be borne in mind by the designer.

The importance of maintaining equable temperatures, so far as possible, during the run from point to point is emphasised, and the necessity for provision for emptying mains where pumping is intermittent is briefly discussed.

The second part of the article (in No. 3077) consists of a series of diagrams and tables, based mainly on the information given in the Report of the National Physical Laboratory on Tests made on Fuel Oils, and various other sources, together with the principal formulæ used in the preparation of same.

Attention is drawn to the effect of falling temperature during the run from station to station, with the consequent complexity of the hydraulic gradient, and the writer appeals for authentic information on actual heat losses observed on long pipe lines.

A series of approximate constants for pipes of 6 in. to 16 in. diameter, under "streamline" conditions, intended for use in preliminary investigations conclude this portion of the article.

Special attention is drawn in the third part, to the variations in viscosity of various oils under changing temperature, and to the need for further and exhaustive research into the phenomena of heat losses in pipe lines. The article concludes by a brief note on the necessity of computing annual costs before finally deciding on the scheme. W. G. W.

91. Plugging, an Aid to the Producer.—H. R. Shidel. *The Oil Trade*, Dec., 1924.

In the first part of the article, the water problem in oilfields is dealt with, and three main causes of water troubles are enumerated: (1) Faulty casing allowing water to enter the hole and gain access to the producing horizon; (2) Water occurring with oil in the same producing horizon; (3) Percolation of edge water. It is pointed out that, owing to the mineral content of the water, it is frequently found impossible to use cement as a plugging medium in order to cut off water. The use of lead for plugs is next described. 100 per cent. lead in the form of lead wood is placed in the bottom of the well and tamped into place, forming a solid resistant mass, filling the small interstices and making a perfect seal. The lead wool is obtained in the form of strands twisted into ropes, thus enabling any desired amount to be used. The wool is placed in a container and carefully lowered to the bottom of the well and tamping is effected by means of the hammering action of the drilling tools. W. H. T.

92. Improvements in or Relating to Overshots Applicable for Use in Oil Wells and the Like.—E.P. 225,983.

A fishing tool is described which, it is claimed, is less expensive and simpler in construction, than those already in use.

A circular spring band encircling the gripping segments is formed as a broken ring of metal rod, one end of which is anchored in one of the segments. The whole, together with a check ring, is contained in a tubular housing, the end of which is substantially flared. W. H. T.

93. Improved Method of and Apparatus for Boring Wells and the Like.—E.P. 225,931.

This invention relates to the drilling of wells by means of an apparatus in which water is supplied under pressure to a hollow drill head, in which is mounted a hydraulic rotor or turbine. This turbine is driven by the water supply, and by means of gearing drives a tubular stem carrying the cutting tool. The water discharged from the turbine passes through the tubular stem to the bore hole.

The gear, through which the cutter or bit is driven from the turbine, is enclosed in a stationary watertight casing. Satisfactory lubrication of the

gears is thus effected and the water discharged from the turbine can be by-passed directly from the motor to the drilling bit without traversing the gear.
W. H. T.

94. Improvements in or Connected with Apparatus for Boring Earth and Rock.—E.P. 224,968.

A piston and cylinder, providing a reciprocating motion to the boring tool, is mounted vertically in a movable frame, whose position above the floor of the derrick can be altered. The "piston rod" of this power unit acts as the drill stem, through which water can be circulated to the bit.

As boring proceeds, the reciprocating mechanism can be lowered along the slide, and means are provided whereby extra lengths of drill stem can be inserted.
W. H. T.

95. Improvements in Well-Boring Apparatus.—E.P. 226,077.

In this patent an improved combined core-bit and reaming tool is described. According to the invention, the usual pivots are dispensed with, the thrust on each reaming cutter being taken by an abutment on the carrier. The part of the tool which carries the reaming cutters is made hollow, in order that water may be carried through the hollow drilling stem to the cutters. The ream cutters are rectangular in section, and arranged so that they are wedged in position when under pressure due to reaming.

In addition, toothed slips are provided whereby the core can be drawn to the surface.
W. H. T.

96. Improvements in Oil and Gas Savers for Oil and Like Wells.—E.P. 226,060.

The apparatus described comprises, in the main, two separate elements adapted to act as a sealing arrangement around the drilling cable. The two main portions are threaded, so that, on rotating the upper one, longitudinal compression of the main packing may be effected. In addition, means are provided whereby an auxiliary packing may be tightened on to the reciprocating cable or member, by means of a set of followers actuated by a screw. A pair of rollers are provided at the top of the apparatus, in order to prevent undue wear or friction on the drilling cable.
W. H. T.

97. Improvements in or Connected with Apparatus for Boring Earth and Rock for Use in Mines and the Like.—E.P. 224,967.

According to this invention, a bore hole of small diameter is first drilled, and is then enlarged by means of a boring head fitted with two separate boring bits. A heavy pendant bar occupies the small bore hole and a cross head attached to the bar carries the bits. The pendant bar enters for a considerable depth into the small bore-hole, and thus provides guiding means for the boring head. In some cases guiding rollers may be provided for the pendant bar.
W. H. T.

98. Oil-Treating Machine.—U.S.P. 1,514,118.

The machine consists of a specially constructed treating tank, in which all objectionable matter, such as basic sediment, water, etc., can be removed from crude oil. Oil, together with hot water, is sprayed from two nozzles on to the vanes of a propeller and thence to the bottom of the tank by means of a screw blade. The resultant decrease in pressure causes a lowering of surface tension, and together with the heat of the water tends to settle out the water and basic sediment. The flow of the oil is finally retarded by means of suitable baffles, and rises to the top of the tank from whence it is pumped away to storage tanks.
W. H. T.

99. Process for Removing Values from Oil Sands.—U.S.P. 1,514,113.

The oil sands are fed from a hopper into a treating tank and acted upon by a solvent. A plurality of tanks is provided, the first of which contains solvent free from oil, the succeeding ones containing increasing amounts of oil. The oil sands are treated in succession with these solutions, starting with the one containing the most oil in solution. A still is provided, whereby the low boiling fraction can be returned to the solvent tanks, the residue being removed to a storage tank. W. H. T.

100. Improvements in or Relating to Means for Raising or Lowering Well Casings, Well Boring Tools, or the Like.—E.P. 223,322.

The invention provides improved means for raising or lowering casings or tools which can be readily applied to the objects to be lifted, and in which all movable parts can be held securely in position while the device is in operation. The apparatus is adapted to engage the actuating yolk and when engaged to secure the latch from movement. W. H. T.

101. Improvements in, and in the Method of Manufacturing Weldless Jars for Use in Boring for Oil and for Similar Purposes.—E.P. 225,040.

A method of manufacturing weldless jars is described, in which an outstanding projection is left on the top side of the rough forging. This projection is subsequently drilled through near the base, and then cut to allow of separation. The two halves of the projection are subsequently straightened and forged by means of a steam hammer into the desired shape. W. H. T.

102. Improvements in or Connected with Percussive Deep Boring Apparatus, also Applicable for Upward Boring.—E.P. 225,277.

In this invention the boring bar falls by gravity and is lifted by the direct application of the piston rod of a single acting engine. The boring bar is lifted by a flexible connection attached to one end of a rocking lever, the other end of which is attached to the piston rod of the engine. W. H. T.

103. Process for the Recovery of Petroleum.—U.S.P. 1,520,752.

A method is described in which the recovery of petroleum is effected by boiling the oil containing rock with water under pressure. Simultaneously, the mixture is stirred by means of jets of hot water under pressure, introduced tangentially into the mixture. W. H. T.

104. Improvements in or Relating to Jars for Use in Well-Boring.—E.P. 224,398.

An improved construction of jar is described in which welding is dispensed with, thus enabling the jar to be made from any suitable steel or alloy steel. The two members of the jar are shaped by forging, the slotted member being belled out at one end to allow of the insertion of the second member, the latter being fitted with ribs to coincide with the slots in the former. Subsequent hammering or pressing serves to ensure a correct fit between the members. W. H. T.

105. Improvements in Instrument for Surveying Bore-Holes.—E.P. 226,079.

The instrument described is used for ascertaining the dip and strike of strata encountered when sinking bore-holes. By means of suitably inclined and illuminated mirrors, photographs of the sides of the bore-hole are taken. A

compass placed below the instrument enables the direction of dip at any part of the strata to be taken. The component parts are enclosed in a tubular casing, which can be lowered to any desired depth in the bore-hole.

W. H. T.

Coal and Shale.

106. The Hydrogenation and Liquefaction of Coal—Part I. H. G. Shatwell and J. Ivon Graham. Fuel IV. 1.

This paper forms the first part of a record of a series of investigations started by the authors two years ago. Concerning the hydrogenation of coal, Bergius considers that coals containing less than 85 per cent. of carbon (ash-free dry basis) can be readily liquified, leaving nothing but ash, whereas coals of over 85 per cent. carbon are only partially converted. He thus draws a line of demarcation and as it seemed possible that the coals he used under 85 per cent. were lignitic in character and those above 85 per cent. resembled steam coals, it was considered that the treatment of highly oxygenated non-coking bituminous coals should be investigated. It was decided to test the action of hydrogen at over 100 atmospheres pressure, and at temperatures about 400° C. on the macroscopic ingredients (durain, clarain, vitrain and fusain), and on the alpha, beta, and gamma compounds into which each ingredient may be separated by the action of pyridine and chloroform. Also experiments with typical coals differing widely in composition.

The objects of the investigations are to ascertain how far the Bergius method is applicable to British coals, and to ascertain the conditions which most readily induce hydrogenation and by correlating the results of other methods of investigations to obtain a better insight into the constitution of coal, if possible.

Experiments were first made on clarain (81·25 per cent. carbon) in the dry state, but with little success. Subsequently a liquid medium (phenol) was used in which clarain and fusain have been treated.

The coal was first ground to pass a 60's mesh sieve. Some of the experiments were carried out in steel tubes capable of withstanding 200 atm. pressure at 450° C. and having a capacity of 400 ccs. while others have been made in a rotating autoclave of 4 litres capacity made of nickel steel 3 in. thick, to withstand pressures up to 500 atm. and 500° temp.

In early experiments using dry coal dust and hydrogen 4·46 per cent. to 11 per cent. of the original was converted into a thick black tar.

Using gas oil as a liquid medium 40 per cent. of the coal was converted, when heated for four hours at 415° C. in the presence of hydrogen.

In subsequent experiments phenol was employed as the liquid medium.

Clarain.—After 3 hours at 416° in presence of hydrogen, yielded 56·2 per cent. soluble in phenol of which 53 per cent. was soluble in chloroform. After 13 hours heating with phenol and hydrogen clarain yielded 37·7 per cent. soluble in ether.

Heated in presence of phenol and nitrogen under similar conditions only 8·3 per cent. was soluble in the phenol.

Durain heated in phenol for 4 days with a fresh charge of hydrogen each day absorbed 4·49 per cent. hydrogen. The product consisted of 37·5 per cent. insoluble residue, 7·5 per cent. soluble in phenol (a brown powder), 37·5 per cent. soluble in ether. Loss 17·2 per cent.

Fusain when hydrogenated under similar conditions showed little change, 95 per cent. appeared to be unaltered.

107. *Coal of high carbon content* (91·5 per cent.) was hydrogenated in the presence of phenol; 55·4 per cent. was soluble in phenol of which 47 per cent. was soluble in ether. When heated at ordinary pressures to 600° C. this coal yielded only 2 per cent. of tar oil and water. The possibility of hydrogenating coal under high pressures and temperatures between 400° and 436° C. has been definitely confirmed and liquid products obtained. The statement made by Bergius that coal containing over 85 per cent. carbon is difficult to liquify has been refuted.

The nature of the liquids prepared has not been elucidated, but they appear to contain oxygen. The nature of the action of phenol or mineral oil in accelerating liquifaction is not clear.

The yields from clarain and durain are approximately the same, giving almost identical analytical results, which would appear to support the view of Tideswell and Wheeler that clarain and durain from the same coal contain constituents of similar chemical type.

Comparative results of analysis of the products from distillation and hydrogenation of clarain, in the dry condition, are shown, and indicate that hydrogenation at high pressures involves initially a selective removal of oxygen. The view that clarain contains a number of hydroxyl groups appears to be supported, such groups being partially removed by heating under pressure with nitrogen, but more completely with hydrogen.

R. P.

108. Low Temperature Distillation. H. Nielsen. *Chem. Trade J. and Chem. Eng.*, 1924, **75**, 549.

Economic considerations demand that the products produced must compete in price with similar products from other sources, and the solid residue with raw coal. The value of low-temperature oils is at present unknown and only in isolated cases will it pay to recover the ammonia. Only 3,000 to 3,500 c. ft. of gas per ton should be obtained under proper low-temperature conditions, and this will be of low calorific value, since components of high calorific value are the result of secondary decomposition of the liquid primary products. Overall costs of treating should not exceed 4s. a ton, and capital costs 10s.—12s. per ton of raw material dealt with per annum. Technical requirements are (1) raw material must be treated in bulk, (2) the desired reaction temperature must be easily attained and maintained without variation, (3) strict temperature control, (4) rapid treatment to obtain maximum throughput, (5) lowest possible distillation temperature to avoid secondary reactions, (6) control of time duration in various heat zones, (7) counter-current principles so that products formed never get into hotter zone, (8) rapid removal of distillation products, (9) retort to act as separator of products from raw material, (10) continuous treatment. Carbonaceous materials are extremely bad conductors of heat. With a temperature difference of 200—250° C. the rate of penetration is only 0·75—1·0 in. per hour, the rate decreasing with decrease of temperature difference. Thus, a coal thickness of 4 ins. requires 5—6 hours to completely carbonise. Therefore, a multiplication of the heating surfaces or a decrease in the thickness of the layer of material are necessary to get rapid distillation. In the "L and N" process an inclined rotating cylindrical retort is heated internally by the hot gases from a water-gas plant, which enter at the lower end and travel counter current to the descending carbonaceous material which is in a finely-crushed condition. Air locks at both ends of the retort enable charging, discharging and removal of the distillation vapours to be carried out without admitting any air. The carbonaceous residue forms a smokeless fuel; but if briquetted with pitch in the usual manner naturally burns with a smoky flame. If, however, the raw material is given a preliminary heating and then briquetted

before the final distillation, a smokeless briquette is formed without the aid of a pitch binder. The residue also forms an excellent powdered fuel which is not liable to spontaneous combustion or explosion. Dried sewage can also be distilled in this retort and 18—20 gals. per ton of animal and vegetable oil obtained. F. G. P. R.

109. The Situation of the Bituminous Shale Industry in France. M. R. Brunschweig. Annales des Mines, 1924, **6**, 1-31.

The author gives a careful comparative study of the financial position of the shale industry under pre- and post-war conditions, and then proceeds to a similar study of the Scottish industry. Before the war shale was worked at Antun and Aumance, but the latter has now closed down and at the former the annual tonnage has been reduced from 150,000 to 50,000. Pumpherston retorts are employed which give a yield of 90 litres of oil per ton of shale, and 13 kilos. of sulphate of ammonia. The old type of French retorts only gave 47 litres of oil and no sulphate of ammonia.

In pre-war days the profit on a ton of shale, without allowing for amortisation, was 7 francs, and is now 11·45 francs. Allowing for amortisation in 20 years these profits equal a dividend of 12 and 25 per cent. respectively on capital, but on account of the enormous rise in price of materials since the war the 25 per cent. is reduced to less than 3 per cent. where allowance is made for replacement of plant at present-day prices. In the Scottish industry in pre-war days, with a throughput of approximately three million tons, actually the profit per ton of shale was 2s. 9d., or 1s. 2d. allowing for amortisation, dividends of 7 to 25 per cent. being paid between 1893 and 1913. At the present day, however, the Scottish Industry is only kept alive by the assistance of a supply of crude petroleum oil from Persia, which enables the refineries to be maintained at full throughput. From these facts their conclusion is drawn that it is impossible to contemplate enlarging the works at Antun or constructing new ones in France, and that the only solution of the industry lies in research on methods of retorting shale and refining the oil which will show greater efficiency than those at present employed.

F. G. P. R.

110. American Progress in Retorting Oil Shale. S. D. Kirkpatrick. *Chem. Met. Eng.*, 1924, **31**, 770.

A table is given indicating the principal characteristics of 44 out of the hundred or more retorts invented in the U.S.A. during the last few years. Their "present status" is also given, but in only one case is any retort shown as working continuously on a commercial scale. Most are classed as having operated intermittently or "now inactive." F. G. P. R.

111. A Colorado Oil-Shale Development. S. D. Kirkpatrick. *Chem. Met. Eng.*, 1924, **31**, 773.

The plant of the Index Shale Co. was erected two years ago to work shale at Mount Blaine, but only preliminary runs were made which indicated the necessity of changes in design. The retort consists of three 20 ft. by 30 ins. horizontal rotary retorts connected up in line and fired externally by oil burners. Gas off-takes occur between each retort and at the end of the last one, but although fractional distillation was expected, it was found in practice that most of the vapours come off at the end of the retort. A fixed helical screw within the retorts, which are rotated independently of one another, moves the shale along. The furnace temperature is kept around 1100° F., but the issuing oil vapours never get above 550° F. No figures for yields of oil are given.

F. G. P. R.

112. PRODUCING SHALE OIL ON A COMMERCIAL BASIS. S. D. Kirkpatrick. *Chem. Met. Eng.*, 1924, **31**, 771.

A description is given of the plant and refining process employed by the Catlin Shale Products Co. at Elko, Nev., U.S.A. The shale occurs in a 5-ft. seam yielding 35—40 gals. of oil to the ton and is mined by inclined shafts, about 100 tons a day being won at present. Two Catlin retorts, having a capacity of 100 tons in 24 hours, are erected, but only one is in operation. The retort resembles a blast furnace and the shale is heated by hot gases from combustion of the fixed carbon in the spent shale in the lower portion of the retort. The oil vapours pass through a dust separator, a carrier air-washing apparatus and a Cottrell electric fog precipitator to ensure complete removal of all condensible matter, incondensible gases being burnt under boilers. The shale oil is refined in the usual manner. Fifteen to 20 per cent. of high melting wax is obtained which is filtered through decolorising earth found close to the refinery and known as Triolite. Sulphuric acid and alkali are employed in refining the distillate oils. The lubricating oils obtained are claimed to give superior results to similar petroleum oils.

F. G. P. R.

113. IMPROVEMENTS IN OR RELATING TO THE DISTILLATION OR TREATMENT OF CARBONACEOUS AND OTHER MATERIALS, AND TO THE RECOVERY AND TREATMENT OF THE HYDROCARBON OILS CONTAINED THEREIN. P. M. Salerni and E. M. Salerni. E.P. 224,568 of May 15, 1923.

Carbonaceous material is distilled by passing it through a series of heated troughs or cylinders arranged side by side. The troughs are corrugated to allow of better heat transference and also for expansion and contraction. A common cover is provided for the troughs, the joint being a seal filled with a material such as molten lead, clay, heavy oil or sand. Partitions are arranged to prevent the admixture of vapours driven off in the various sections of the retort. A preliminary drying device is mounted above the retorts. Each trough is fitted with a stirring device, and the passage of material through the system is controlled by regulating the feed at one end. In the preliminary stages water is driven off and this is not condensed. The removal of the hydrocarbons at each stage as they are set free prevents them being cracked into permanent gas. The coke is cooled by passing it through a cylinder whose walls have external ribs and which is fitted with an agitator. A jacket surrounds the cylinder and is filled with a cooling medium or the air required for burners is passed through it.

T. A. S.

Abstracts.

Arranged by W. H. Thomas, A.R.S.M.

Abstractors.—S. F. Birch, Ph.D., S. Bowman, F.I.C., S. T. Card, B.Sc., R. W. L. Clarke, B.Sc., F.I.C., C. V. Hill, B.Sc., A. Laird, B.Sc., J. E. Marshall-Hall, A.R.S.M., H. Moore, M.Sc., A.I.C., F.C.S., F. G. P. Remfrey, B.A., D.Sc., F.I.C., G. Sell, T. A. Smith, B.Sc., F.I.C., W. H. Thomas, A.R.S.M., and W. G. Weeks, A.R.S.M.

General.

114. Oil Pollution. *Cull and Co.'s Financial Review*, March, 1925.

The ever-increasing use of fuel oil for ship propulsion has introduced a serious and objectionable nuisance, that of pollution of the foreshore near ports, oil depots, etc., with consequent damage, not only to property, but also to bird and marine life. The Chamber of Shipping, along with the Liverpool Steamship Owners' Association, appointed a committee to investigate.

There are three chief sources of pollution possible. First, discharges from oil tank vessels during cleaning operations, and to the use of tanks for fuel oil and water ballast alternatively. Secondly, naval craft; and finally, the breaking up of sunken vessels.

Effective preventive measures can only succeed with international support and co-operation of respective naval authorities. Legislation is deemed necessary only for crude petroleum and various classes of residual fuels.

For oil separation from, say, bilge water, suitable compact plant could be installed. Where tankers are concerned, the utilisation of barges, fitted with separators, would appear a practical proposition. Emulsions, however, present a difficulty, the ordinary type of gravity separators being useless. Heating apparatus and time for settling are necessary. However, means, meeting economical requirements of shipowners, are still an essential qualification.

Certain recommendations were put forward, tentatively. The chief point was the need for identical regulations in all maritime countries. Diesel oil, fuels and crude only to come under legislation. Discharge of oily ballast water, etc., by all vessels other than naval craft, to be prohibited under a distance of 150 miles from the nearest coast. Compulsory records of such discharges to be made in the ships' log. Naval authorities to impose regulations on naval craft. Port authorities throughout the world should be responsible for providing separating barges or other receptacles for vessels driven by or carrying oil. A. L.

115. Evaporation's Daily Toll. J. B. Rathbun. *Petr. Age*, 1925, **15**, 17.

The author gives a general survey of the conditions under which evaporation losses occur in storage tanks. Reliable conclusions as to the exact amount of loss from different observers vary within too wide limits owing to the difficulty of taking exact measurements of all the factors affecting evaporation during a given period. Variations in temperature are responsible for more losses and error in measurement than all other causes combined. With rising temperature the outer skin of gasoline warms up quickest and evaporates most quickly, whilst with a falling temperature the central

portions remain hot the longest. Owing to greater surface of warm oil exposed evaporation is greater when the air temperature commences to drop than when it starts to rise. Free surface exposed to evaporation is a great factor in the amount lost. In vertical tanks this surface is constant, but in horizontal cylindrical tanks a half-full tank has the largest evaporative surface, and also the largest surface in relation to the bulk of the oil. Lightest portions evaporate first and most quickly, the rate falling off as these are lost, and eventually heavy ends remain which will upset the quality of the next batch of oil put into the tank. Venting losses vary with vapour pressure of oil, but small differences in size of vent make astonishing variations in the quantity of the losses. Leaking seams which are so small as to show no wet mark outside may account for half gallon loss in 24 hours.

F. G. P. R.

116. Some Experiments in Gas Explosions in Closed Tubes with Particular Reference to "Pinking." By J. D. Morgan, M.Sc. *Automobile Eng.*, **15**, 198; p. 27 (Jan., 1925).

The author noticed that when certain coal-gas air mixtures were ignited in two closed tubes of the same diameter, but of lengths of 12 in. and 24 in. respectively, then, in the case of the shorter tube the combustion was silent, but in the other case a sharp "ping" was heard. This sound was considered to be similar to the "pinking" which occurs in the automobile engine. The fact that the length of explosion tube may alter the character of the explosion was known previously (H. B. Dixon). Mixtures of methane and air burned silently in every case. When silent-burning mixtures were used it was found that the time required for the flame to traverse the 24 in. tube was double that required for the 12 in. tube. With coal gas-air mixture, however, the time taken in the case of the 24 in. tube (a "pinking" explosion) was much less than double that in the use of the 12 in. tube (a silent explosion), though the velocity measurements in the former case were not concordant. By means of a springy diaphragm at the end of the tube, converted to a suitable amplifying and recording apparatus, strong longitudinal vibrations were detected at periods during a "pinking" explosion. A silent explosion did not exhibit these vibrations. The author considers that the principal cause of pinking is an appropriate combination of rate of heat development with the frequency of longitudinal vibration of the gas in the vessel.

S. T. C.

117. A Contribution to the Theory of Fuels for Motors. M. Brutzkus. *Bull. soc. encour. ind. nat.*, 1924, **136**, 397-425.

From Le Chatelier's law of equilibrium it is deduced that the best criterion for efficiency in the use of motor fuels is the change in the number of molecules after combustion has taken place. The percentage of hydrogen present thus becomes more important than such properties as the specific gravity, calorific value and so on. Motor fuels are capable of division into three classes. In the first of these the number of molecules increases after combustion. All liquid fuels, including ethane, propane and butane (which may be regarded as low-boiling liquid fuels) come under this heading; they are best employed in the constant-pressure cycle (Diesel). The second class includes fuels giving no increase in the number of molecules, and under this heading are placed all the industrial gases; they are best employed in the constant-volume cycle (Otto cycle). The third class includes natural gas, methane and ethylene; these should burn in either cycle equally well. Although all liquid fuels should be employed in the Diesel cycle they are more often utilised in the Otto cycle, as the engine required is much simpler. Petrol and alcohol, however, are two exceptions owing to the cooling effect

of the injection air required for the Diesel engine. Slow burning fuels which give only a slight volume change on combustion are best employed in the Otto cycle. S. F. B.

118. Exhaust Gases from Engines using Ethyl Gasoline. R. R. Sayers, A. C. Fieldner, W. P. Yant, B. G. H. Thomas, and W. J. McConnell. *U.S. Bureau Mines Rept. Investigations No.* 2661, 1924.

Tests on various animals placed in a chamber into which diluted exhaust gas was passed from a small Delco engine, run on benzine containing lead tetraethyl (3 c.c.) and ethylene dibromide or trichlorethylene (2 c.c. per gallon), indicate that no objectionable symptoms develop. Of the lead inhaled, 85 per cent. is exhaled. Accumulation of lead in the tissues did not give any indications of lead poisoning. Tests carried out on men inhaling diluted exhaust gas from spirit containing three times the quantity of lead tetraethyl given above showed that there is little to be feared from this source. S. F. B.

119. Shortage of Benzol. *Petr. Times*, Jan. 31, 1925, p. 195.

Owing to the depression in the iron and steel industries in Britain and Germany, the production of coke, and therefore of benzol, has been curtailed. This resulted in the recent announcement that certain benzol-petrol mixtures would, in future, contain a lower percentage of benzol. The National Benzol Company, however, have since reverted to their 50-50 standard.

Prior to the war benzol was produced in Germany in excess of demand and found an outlet as a solvent; now it is widely used as a motor fuel *per se* and commands a price some 20 per cent. higher than that of petrol. The Benzol Association in Germany is afraid that the high price will drive consumers back to petrol, and that they will not readily revert to benzol when the price of the latter is reduced. It has therefore come to an arrangement with petrol distributors in Germany to market a benzol-petrol mixture at approximately the same price as petrol, in the hope that this will preserve the benzol market.

Benzol, though chiefly derived from coke-ovens, may also be obtained by scrubbing town gas, and during the war large quantities were produced in this way; but, when petrol prices fell, the method ceased to be attractive, and it was stated to be actually more profitable to dispose of the benzol in the gas for its heat units than to recover it. A cheap and simple method of recovery is much to be desired. C. V. H.

120. The Internal-Combustion Boiler. Oscar Brunler. *J. Soc. Chem. Ind.*, **44**, 8, 187-190, Feb. 20, 1925.

It is nearly thirty years since the first experiments of burning an open flame in liquids were made, and fourteen years since the first boiler which would work continuously was made. All boiler designs are based on the principle of bringing the fuel flame into the closest possible contact with the water, and the question of burning fuel in actual contact with water is demonstrated in the internal-combustion boiler. Over sixty kinds of oil have been so burnt successfully.

The fuel, and the air necessary for combustion, is fed to the burner under pressure. Before starting the water valve is closed, the water level being below the mouth of the burner. When the burner is hot enough, the water valve is opened and the water rises to the middle of the burner, and the flame, burning quietly in the water, can be observed through peep-holes in the generator. A small burner in the steam reservoir acts as a super-heater. The size of the flame is controlled by a regulating valve, the ratio of fuel and air remaining unchanged.

Tests carried out with the submerged flame have frequently given efficiencies higher than the theoretical efficiency of the fuel as determined by analysis and calorific value. The flame has been used in the concentration of more than twenty different chemical solutions, without difficulty, and can be used for peat drying. G. S.

121. Technology of Soap Manufacture. E. L. Lederer. *Z. angew. Chem.*, 1924, **37**, 637, from *Chem. Trade J.*, 1924, **75**, 675-677.

Efforts in this industry are being made to utilise the saponifiable oils obtained on oxidation of hydrocarbons. The oils obtained from paraffin and similar hydrocarbons become progressively softer as the degree of oxidation increases until finally the soap cannot be salted out. This difficulty is overcome by the addition of 40 per cent. of hard fatty acids before saponification.

The difficulties encountered in oxidising such substances as paraffin wax are by no means overcome yet. Attempts to oxidise such substances by oxygen under pressure at 120–150° C. in the presence of barium or lead peroxide, have failed. The steel walls of the autoclave have been found to exert a considerable influence on the reaction which is absent when glass or porcelain linings are used. Another method, in which the atomised oil is forced into oxygen at a temperature between the boiling point and melting point of the oil, appears to have been more successful. It is said that soaps prepared from these synthetic acids cause a skin rash. Naphthene soaps, prepared from naphthenic acids, on the other hand, are not only non-irritating, but have certain antiseptic properties; they are very suitable for washing delicate fabrics, such as silks, which must be protected from strong washing media. Their unmistakable odour can be overcome by treating the crude naphthenic acids with formaldehyde, or any substance capable of giving off formaldehyde, under pressure at an elevated temperature; followed by a vacuum distillation to remove resinous products. Soaps, prepared from naphthenic acids boiling at 280° C. under ordinary pressure are also odourless. The odour is generally due to the unsaponified matter and if this is removed by extraction with organic solvents such as benzine or benzene, the soap becomes permanently odourless. S. F. B.

122. Oil from Vulcanised Rubber, Improved Manufacture of. Albert Bray. Brit. Pat. 226,475. *Conv.* (Belgium), Dec. 18, 1923.

Vulcanised rubber is distilled in a cast iron retort and the crude oil obtained is repeatedly distilled in the presence of phosphoric acid until the product is white. The distillate is then mixed with a 10 per cent. solution of hypochlorite or bisulphite of soda, and then with one-fifth or one-third of its volume of a 10 per cent. aqueous solution of caustic soda. It is washed with water, separated by decantation and finally filtered in a clayey substance. The oils collected are those distilling between 95° and 200° C. G. S.

123. Organising and Maintaining Fire Department. Gwynne Raymond. *Refiner* **4**, No. 2, 14–18, 28, 31–32, 34, Feb., 1925.

Fire drill is essential to a refinery, ensuring methodical operations in the event of a fire breaking out. The fire chief should be conversant with the operating conditions of the refinery and assumes sole responsibility in the event of fire, his first duty being care of the oil and operations, providing no lives are in danger. The second man is the fire marshal, whose duty is to smother the flames, line up the crews, etc. He should be thoroughly acquainted with the fire equipment and in charge of the drilling of the fire crews. Steam supply is of vital importance during fire and those responsible

for this should be impressed with the importance of remaining at their posts. Fire crews should be composed of men who can be spared from their positions without endangering their own particular department.

The article concludes with a set of fire rules setting out the procedure in case of fire and detailing the duties of the fire organisation. G. S.

124. Lightning Probably Greatest Factor in Industry's Fire Loss. Ralph J. Reed. *Nat. Petr. News*, **17**, No. 3, 62-64, Jan. 21, 1925.

The number of fires in storage-tanks is small when compared with the number of tanks in use. Records collected by the Pacific Coast Group of the Committee on Fire Prevention and Protection to Life and Property, based on a unit called the "tank-year"—*i.e.*, one year of service for one tank, show that one fire occurs for each 504 tank-years, the assumption being that two-thirds are caused by lightning.

When a storage-tank is fired by lightning it is probable that vapours escaping from openings are directly fired by a lightning discharge. Storage tanks which are gas-tight and in themselves a continuous structure practically need no protection from lightning.

The size and construction of tanks varies so greatly that a universal type of protection cannot be applied. Modern methods are rapidly eliminating the old wooden roofs, which are being replaced by steel vapour-tight roofs or with tight insulated covers sealed to the tank shell and provided with a network of conductors above the roof and well grounded. This latter type is said to be practically immune from lightning. Floating roofs claim to be fireproof, but no records were available. Steel underground tanks are probably immune from lightning on account of their buried condition. G. S.

125. Lightning Protection of Agitators, and a Doctor Treating Method. Paul Truesdell. *Nat. Petr. News*, **17**, No. 3, 59-62, Jan. 21, 1925.

Air agitation of distillate causes vaporisation, especially on warm summer days, and this vapour travelling along the ground is likely to come into contact with a means of ignition and a flash of flame is carried back to the agitator. The other hazard in this connection is lightning. Vapours collecting under the roof of the agitator and escaping through hatches and other openings furnish bait for lightning. Placing a gas-tight roof on agitators and leading vapours to a safe distance through a gas line provided with a flame-proof outlet is recommended. A series of questions were put to a number of refiners, and replies showed considerable difference of opinion. Some stated that fires occurred while putting sulphur into the batch, while others regarded static electricity as the cause. A Kansas refiner considered static electricity to be caused by acid getting in the ground around the agitators and charging the ground.

The question of Doctor treating as a step in the treatment of distillates is brought up, and can be carried out in a conical-bottomed tank, similar to an agitator, a circulating pump being used to take the Doctor solution from the draw-off line at the bottom and recirculate it to the top. The process is continued until the distillate shows sweet to the Doctor test. G. S.

126. Some Aromatic Hydrocarbons in Byoritsu Crude Oil in Formosa. Kozaburo Kurihara. *J. Chem. Ind.*, Japan, 1924, **27**, 831-840.

The distillate, particularly the lower fractions, from Byoritsu crude oil from Formosa, has been found to be rich in aromatic hydrocarbons. Various methods such as nitration, sulphonation, oxidation and other procedures have confirmed the presence of benzene, toluene, *m*- and *p*-xylenes, mesitylene and naphthalene. A fraction boiling up to 155° was found to contain (using

Thole's indirect method) 3·1 per cent. benzene, 20·2 per cent. toluene and 20·9 per cent. of xylenes. The crude oil itself contained 1, 8 and 8 per cents. of these hydrocarbons respectively. No trace of ethylbenzene could be detected. S. F. B.

127. Distribution of Sulphur in the Fractions from Crude Petroleum. A. P. Bjerregaard. *Ind. Eng. Chem.*, 1925, **17**, 142-144.

The determination of sulphur in the various fractions obtained on distillation of one Mexican and several American crude oils shows that the sulphur tends to accumulate in the higher fractions. Quite a considerable loss of sulphur occurs in the uncondensed gases formed during the distillation of crudes having a high sulphur content, and a further loss from similar causes occurs during the redistillation of the gasoline from them. The distillation of gasoline to which free sulphur has been added, without the use of steam, leads to the formation of volatile sulphur compounds in the distillate. S. F. B.

128. The Kentucky Rock Asphalts: Their Character and Utilization. By C. P. McCormack. *Nat. Petr. News*, Feb. 11, 1925.

The Kentucky Rock Asphalt as found in Edmonson County is a fine grained sandstone evenly impregnated with bitumen. The bitumen has all the appearance of a petroleum residue, and contains 60 per cent. asphalt and 40 per cent. petrolene. The bitumen content varies between 1 and 15 per cent. by weight of the sandstone. The material most suitable for road surfacing contains about 7 per cent. of bitumen.

The deposits occur in the Pottsville Conglomerates and Chester sandstones of the lower Pennsylvanian system, and are found as fairly flat sheets of between 10 and 80 feet in thickness. It is suggested that these asphaltic sandstones are the result of the inspissation of crude oil previously held in the sandstone.

Exploitation of the deposits is rendered very difficult owing to the lack of proper transport facilities, but in most localities, steam shovels and other mechanical equipment are used.

Exploitation and development of the measures are carried out by means of core drills.

After being quarried, the rock is crushed to about 30 mesh size, in which condition the material is ready for use.

The crushed rock is laid on the road base in a 2 inch layer, and rolled to a thickness of 1½ inches, forming a dense, hard but resilient surface. W. H. T.

129. The Solid Natural Hydrocarbons. *Pet. Times*, **13**, 325, Mar. 28, 1925.

An interesting article upon the asphaltic hydrocarbons (Gilsonite, Wurtzilite, Grahamite and Manjak) not much noticed in petroleum literature.

Gilsonite.—A black, brittle, asphaltic substance—one of the purest of the natural hydrocarbons. It is only found along the Utah-Colorado border. It occurs in perpendicular veins, varying in thickness (3 ft. to 18 ft.). These are generally in shale, but sometimes in limestone. Generally the veins are worked to about 250 to 300 ft. in depth. Fire-damp has to be guarded against. It resists the action of acids and alkalis, and one of its principal uses is as a base for paints for protecting steelwork from corrosion. It is also used for making black enamels for finishing coats to automobiles. Also for saturating felts, for insulating compounds, and in the manufacture of automobile tyres, and with other rubber products.

In 1918, 30,848 tons were produced; in 1920, 56,204 tons; in 1923, 34,425 tons. The prices varied from $36 a ton, to $33 and $25¼.

Wurtzilite.—Resembles gilsonite but is softer and more elastic. Its Sp. Gr. is 1·05 to 1·07, and hardness between 2 and 3. It is less abundant than gilsonite, but more valuable weight for weight. It is only known in Uintah County, Utah. It occurs in veins varying from a few inches to some 3 ft. in width. It is an insoluble, refractory mixture of hydrocarbons, and has to be heated to about 500° F. under pressure for several days to render it soluble in the usual solvents. It is then called "Kapok." It is used for a protective paint for coating tanks employed for holding acid liquors or solution of corrosive salts. It is used in rubber compounding, because of its elastic properties.

Grahamite.—Is heavier than either of the above, and contains more mineral matter. Sp. Gr. 1·15 to 1·50. Hardness 2 to 3. It is found in several localities in the U.S.A. in Cuba, Trinidad, in Mexico, and some other countries. It forms veins, the largest 19 to 25 ft. in width and over a mile long (Oklahoma). It is mixed with other asphaltic compounds to form a rubbery elastic covering very satisfactory for roofing. It also gives varnishes with certain bitumens, and rubber substitutes for water-proofing, and for electric insulation.

Manjak.—Is a high grade bitumen, with conchoidal fracture. It is found in the island of Barbados. Its principal uses are for paints and varnishes —usually mixed with mineral oils. These cover pipelines, structural steel work and machinery protectively. It also is used as a pipe cement.

These hydrocarbons are considered to be actual petroleum residues produced by a natural distillation of the liquid (asphaltic) petroleums. J. E. M. H.

130. Motor Fuel, Method of Producing. Henry Clay Wade. U.S. Pat. 1,525,421.

An atomiser or injector connects to the intake of a heating coil, and gas, oil and water are fed into the atomiser through three concentric tubes. The water is pre-heated to at least 212° F., and on leaving the atomiser suddenly converts into steam, the explosive action breaking the hydrocarbon bodies into minute particles and giving a high recovery of liquid hydrocarbons from natural or casing-head gas. An attenuated-mesh form of catalyser is inserted in the coil near the outlet end, and the coil leads to a condenser, which discharges into a collecting tank. G. S.

131. Fuel for Internal-Combustion Engines. J. F. P. de La Riboisere. U.S. Pat., 1,519,905, 16 Dec., 1924. (Appl. Sept. 24, 1923.)

The fuel consists mainly of liquid hydrocarbons boiling above 160°. A small proportion of low boiling aliphatic ether is also present with sufficient mono-hydroxy-phenol to retain the ether in the mixture. T. A. S.

132. Improvements in or relating to Fuels for Internal Combustion Engines. E.P. 224,102.

This invention relates to the use of lead alkyl and aryl compounds in hydrocarbon fuels for preventing knocking. Its principal object is to form with the fuel and lead compound a combination which burns in the engine yielding a lead compound which has a relatively low fluxing action as contrasted with lead oxide.

This combination may be effected by employing., *e.g.* with lead tetraethyl, a chlorine compound, *e.g.* CCl_4.

The hydrocarbon may be burned in the engine in presence of a lead compound having a component which, during combustion, forms with the lead, a lead compound non-fluxing in character.

The fuel may include a hydrocarbon and a lead compound, and also a compound having a component which combines with the lead during combustion to give the desired effect.

The lead compound may be admixed with the fuel, and have a component which on combustion gives a compound of lead with non-fluxing action. For example, it may be a tetravalent lead compound, part valency satisfied with alkyls or phenyls and part satisfied with halides. A. L.

133. Improvements in the Manufacture and Production of Liquid Fuels. Badische Anilin- and Soda-Fabrik. E.P. 226,731 of Jan., 1924.

The tendency of a liquid fuel to cause an internal-combustion engine to "knock" is reduced or removed by adding to the fuel a small amount of a carbonyl compound of iron. The quantity required varies according to the particular fuel, but generally speaking an amount between a tenth and 1 per cent. will be sufficient, *e.g.* 10 grammes per gall. or less. C. V. H.

134. Compound for Addition to Motor Fuel and the Fuel resulting from such Addition. S. Sadler, Assr. to C. C. Benton. U.S.P. 1,524,674 of Feb. 3, 1925 (Appl., Nov. 29, 1922).

A concentrated solution of pyridine in petroleum spirit is added to gasoline. T. A. S.

135. Improvements in Dehydrating Alcohols and like Hygroscopic Liquids. J. A. Steffens. E.P. 220,606.

Alcohols and similar liquids may be dehydrated in a column still with the aid of benzol or other volatile liquids, insoluble or practically insoluble in water such as gasoline, etc. The whole of the vapours from the still are condensed in such a manner that the condensate is almost at the still-head temperature, when it will consist of two liquids, one light and the other heavy. Roughly a third of the latter is removed and the rest of the condensate returned to the still, from the bottom of which absolute alcohol may be obtained. The minor portion of the heavy liquid which is withdrawn is redistilled, and the distillate, which contains alcohol and benzene, returned to the first still. A still with a suitable column for carrying out the process is described. S. F. B.

136. Improved Process for Dehydrating Alcohol. P. Verola, C. Baron, A. Verley and E. Urbain. E.P. 210,432.

Alcohol may be dehydrated by distillation in the presence of previously fused potassium acetate and of a substance readily soluble in alcohol and in potassium acetate solution, such as phenol, cresol or a higher alcohol, cyclic or otherwise. The function of the latter substance is to assist in the solution of the potassium acetate and also to cause the solid left in the still to swell, when it is completely dehydrated and ready for further use. S. F. B.

137. Transmission of Heat from one Medium to Another: Improvements in Apparatus for. Erik Sigfrid Lynger. E.P. 217,895 (Conv., Sweden, June 19, 1923).

The apparatus consists of a centrifugal blower, the vane wheel of which is adapted to absorb heat from the hot medium and deliver it to the cold medium. The inlet of the blower is divided into compartments, separated by adjustable partitions, and the casing of the blower is provided with corresponding outlets. The vane, which is made up of annular discs with distance pieces or spacers having the bent form of blower vanes. G. S.

138. Viscous Liquids, a New or Improved Apparatus for Delivering, under Pressure, Measured Quantities direct into Tanks or other Receptacles. Walter William Baldwin. E.P. 227,281.

Any one liquid from a battery of tanks is measured and delivered, under pressure, into a receptacle without being contaminated by the other liquids. Compressed air is used to force the liquid into the measuring device, and when the required quantity is measured a light appears and the compressed air reverses its course, acting on the top of the piston of the measurer and ejecting the measured quantity of liquid through the service pipe. G. S.

139. Raising Liquids, Improvements in or relating to Systems of. Thomas Gaskell Allen. E.P. 227,242.

Liquids are raised by means of static pressure obtained from a river, etc., a portion of which is maintained, either naturally or artificially, at a higher level. Closed, or open and closed, containers are situated at increasing heights above the liquid to be raised, the closed containers communicating by a conduit containing air with operating chambers located between the low- and high-level water. By the filling and emptying of the operating chambers, pressure and suction acts alternatively on the liquid in the containers, which are all in liquid contact. The lower container is in contact with the liquid to be raised and the upper one has a discharge pipe. G. S.

140. Improvements in or relating to Tanks, Cisterns, Vats and like Storage Receptacles. Joseph Sutton Withers for the Société Anonyme Etablissement Arbel Forges of Douai Forges. E.P. 227,652 of Feb. 19, 1924.

A suitable cavity is dug and floored with concrete to form the foundation of the tank. The latter is constructed of ribbed plates, stamped up from thin sheet metal and having flanged ends which are welded together. The space between the plates and the walls of the cavity is filled with concrete to give the necessary strength. C. V. H.

141. Removing Deposits from Pipe Lines. A. C. Campbell. U.S.P. 1,513,371.

A suitable solution for freeing pipe lines, used in conveying crude oil, from deposits is prepared by mixing 3 parts each of soda ash, sal soda, sodium bicarbonate and spirit with 124 gallons of water. S. F. B.

142 Improvements relating to Gas Measuring and Mixing Apparatus. E.P. 226,022.

In this invention the motive power of one gas is utilised to measure a predetermined quantity of another gas, the two gases being ejected after each cycle of operations and subsequently mixed. It relates, in particular, to apparatus for use with compressed acetylene or other gas.

The gas, under pressure, which provides the motive power, holds on its seat an outlet valve. An opening movement is imparted to this valve, in part by a spring, connected to the measuring apparatus of the other gas. This measuring apparatus may be either of the bellows type measuring chamber, or a suitable cylinder provided with a piston. The same means, with or without a spring, is utilised for closing the valve.

Again independent inlet and outlet valves may be employed for controlling the flow of gas providing the motive power, with arrangements, consisting in part of a spring, made for imparting movement to these valves from the measuring apparatus of the other gas. A. L.

143. Improved Method of Giving to Air and other Gases a Definite Moisture Content. E.P. 204,039.

This invention depends upon the fact that the moisture content which will be given to a gas, brought into contact with a suitably selected water-soluble salt or substances, corresponds to a certain equilibrium characteristic to the particular substance.

The gas is brought into contact with a fully concentrated solution of the substance, in minute dispersion, and the solution is subsequently restored both in quantity and quality to the fully concentrated state before being again brought into contact with the gas.

For example, if the air or gas is in such a state of dryness as to take up moisture from the solution, the quantity must be maintained by addition of a corresponding amount of water. A. L.

144. Improvements in Fluid Heaters. E. P. 228,443.

This invention relates to fluid heaters working on the principle of cross currents.

Cells open alternately at the longitudinal sides and at the cross sides, are formed by plates in combination with a suitable casing having independent inlets and outlets for the heat absorbing and heat emitting media. The plates are of plane sheet metal loosely inserted in the casing and placed parallel to the directions of movement of both media. Corrugated sheet metal plates are inserted between these plane plates, their corrugations being alternately parallel to the direction of movement of one medium and to the direction of the other. The plates are pressed together by means of a screw or spring mechanism fixed into the casing. The corrugated plates when compressed bear against supporting members. A. L.

145. Centrifugal Process of Blending Oil and Gas. U.S.P. 1,510,353.

This invention applies to the removal of Gasoline from Natural Gas or Refineries Gas. Large absorbing surfaces are not required, and absorption is quietly effected in a continuous process.

Natural gas, etc. is passed under pressure into a casing containing an absorbing oil. The gas and oil are subjected to combined centrifugal force and agitation by means of a rotor member which causes the oil to bank up and fill the space between the casing and the periphery of the member. The pressure of the gas entering the casing is high enough to overcome that of the banked-up oil, and thus conditions for rapid solution of the gases in the oil are maintained. The solution of gas in oil is continuously removed and subjected to fractional distillation for recovery of the gasoline. A. L.

146. Process and Apparatus for Separating Benzol or Benzine from Mixtures containing Dilute Alcohol. E.P. 210,094.

In processes of Extraction of Organic Materials by means of Alcohol-Benzol or Alcohol-Benzine mixtures, when the materials are not dry, the alcohol is diluted and requires to be concentrated. Distillation alone, as for dilute alcohol, will not accomplish this, and dilution first, followed by separation of benzol or benzine, and then rectification of the alcohol, is costly.

This invention provides an economical means of concentration.

The mixture of varying proportions of benzol, alcohol and water is distilled until a residue of alcohol and one other constituent is obtained. If the residue is alcohol and benzol or benzine, the distillate is diluted and dealt with as usual. The separated constituent is added to the residue. If the residue is alcohol and water, it itself, perhaps with diluted alcohol from the distillate, is rectified as before.

An apparatus for continuous process, comprises a preliminary colour for distillation of the original mixture, and a rectifying colour for the dilute alcohol. The columns are connected over a separator for separating hydrocarbon from distillate, diluted with water, and also over a pipe leading the residue liquid from the first column into the second. The second, or main, column, is connected with a separator in which the liquid residue may be separated out into hydrocarbon and water. A. L.

147. Wood Preservation.—E.P. 228,119.

This invention relates to the preservation of wood, by impregnating it with emulsions of aqueous wood-preserving agents in oily wood-preserving agents. The disperse phase, the aqueous solution of a wood-preserving material, must be in such a state of sub-division as to pass freely into the pores of the wood. Such an emulsion is one of 15 parts of an aqueous solution of $ZnCl_2$ in about 85 parts of an asphaltic oil. Again, one consisting of 15 parts of a 17·5 per cent. solution of $ZnCl_2$ with a mixture of about 30 parts of asphaltic petroleum residue and about 55 parts of asphaltic base crude oil. Stabilising agents, such as stearine pitch, resin or soaps may be used. A. L.

148. Improvements in Hydraulic Bituminous Cement in Powder and Process for its Production.—G. D. Coletta. E.P. 227,966.

The process describes the preparation of a bituminous cement possessing hydraulic properties.

Portland cement is first intimately mixed with asphaltic bitumen at a temperature of 200° C., together with a quantity of lime and some inert hardening substances. After cooling, the mixture is ground in ball mills with a further quantity of Portland cement to a fine powder. The finished mixture contains :—

Portland Cement	.. ..	70—85 per cent.
Asphaltic Bitumen	.. ..	15—20 „
Lime ..	.. .. ..	3— 4 „
Inert Substances	.. ..	1— 2 „

and is capable of hardening when mixed with water and aggregate in the usual manner. The resulting mortar is claimed to be water-proof. S. B.

149. Improvements in, and Relating to, Bituminous Concrete and the Like Compositions. S. A. Proctor and M. Levy. E.P. 228,257.

A process is described for the manufacture of bituminous concrete by the incorporation of a graded mineral aggregate with a naturally occurring bitumen such as asphalt or Gilsonite. Using suitable reinforcement and acid-resisting material, such concrete is employed for the construction of tanks and vats containing corrosive liquids. S. B.

Testing.

150. A Gas Absorption Pipette.—A. O. Jones. *J. Soc. Chem. Ind.*, 1925, **44**. 115T.

The apparatus consists of an absorption bulb which can be made from a 100 c.c. pipette. The ends of the pipette are cut off close to the bulb, the upper end sealed to a small tap funnel, and the lower end dipping into a mercury seal through which passes a capillary tube leading to the burette. The lower end of the bulb is also connected by rubber tubing to a similar bulb also made from a 100 c.c. pipette. This contains the reagent, which is transferred to and from the absorption bulb by raising and lowering.

The apparatus is thus easily made and, in conjunction with a measuring burette, constitute all that is necessary for most gas analysis. The absorption bulb is easily cleaned out and can be used for successive reagents without contamination of the mercury. S. B.

151. The Determination of the Sulphur Content of Petroleum and Petroleum Products.—J. Helsinga. *Chem. Weekblad.*, 1925, **22**, 98–100.

This is a simple method of sulphur determination applicable to petroleum products generally, from gasolines and kerosenes to asphalt and coke. For gasolines and kerosenes, however, the lamp method is still to be preferred. The method consists in burning the substance in a rapid stream of air in a silica tube, 40 cm. long, with an inside diam. of 1 cm. In the heated portion of the tube several pieces of quartz, 5 by 5 by 2 mm. are placed, to obstruct the course of the vapours and promote perfect combustion. The substance is introduced into the silica tube in a porcelain boat, 72 by 6 by 7 mm. in size, and varies in amount from 60 to 400 mg. according to the sulphur content of the substance. The ignited part of the tube passes through a sheet aluminium shield lined with asbestos, and is heated by a slot burner to a temperature of about 900° C. The tube is preceded by a wash bottle with 10 per cent. solution of caustic soda, but if ammonia fumes are present in the laboratory this is preceded by another wash bottle with diluted sulphuric acid. The end of the tube is coupled to an absorption vessel, similar to that of the A.S.T.M. lamp method, which is filled with 40 c.cm. of a 3 per cent. solution of hydrogen peroxide. Air is drawn through the apparatus at a speed of 1 to 2 litres per minute; the boat is heated by another burner till the oil is volatilised, sometimes taking fire, and the heating continued till completion of combustion. The solution from the absorbing vessel is then titrated with a 1–40 N solution of sodium carbonate. The operation lasts twenty minutes, and the results are very nearly concordant with those of the bomb estimation. H. M.

152. A Simplified Method of Determining the Viscosities of Oils.—M. W. Borodulin. *Petroleum*, 1925, **21**, 445–448.

It is suggested that in place of timing the outflow of 200 c.cm. in an Engler viscometer, the seconds for the outflow of 50 c.cm. be observed, and the figure multiplied by five, the result approximating more or less closely to the standard Engler time of outflow. In a new form of viscometer water is allowed to drop from a glass jet at the rate of about 27 drops per c.cm. It falls into the oil contained in a glass vessel considerably wider than 1·5 cm. provided with thermometer and stirrer and placed in a water bath for the purpose of maintaining the desired temperature. The time taken for the drop to fall a distance of 10 cm. is noted, and is found to bear a more or less constant proportion to the Engler time of outflow, except for viscosities of about 2° Engler or less, where it varies greatly. The apparatus is cheaper than the Engler apparatus, and the time required for a determination less. In comparing his results with the formulæ of Stokes and of Ubbelohde the author found that the relation of former to the latter varies from 1·1 to 1·3 in most cases. H. M.

153. The Rhe as the Absolute Unit of Fluidity. E. C. Bingham. *Ind. Eng. Chem.*, 1925, 17, 47.

The author makes a plea for the adoption of a standard unit of fluidity instead of relative units such as Saybolt seconds, Engler degrees or Redwood units. Specific viscosities, while convenient for dilute solutions are awkward to compare when water is taken as standard at various temperatures. There is unfortunately extraordinary disagreement as to the specific viscosity of

water at 20° C, the data given in literature being incomplete as to all the corrections which are now familiar. The term "rhe" derived from the Greek Rheo (flow) is suggested, and also the desirability of a commission to be chosen to measure the viscosity of water with precision at 20° C. This value should then be taken as standard for calibration purposes. S. B.

154. The Surface Tension of Crude Oils. E. H. Harvey. *Ind. Eng. Chem.*, 1925, 17, 85.

A table showing the surface tension of a complete set of crude oils representing all the important producing fields of the United States is given. These have been determined with the du Nouy tensiometer and the results are compared with the capillary tube and drop methods. A number of pure chemicals have also been examined by the three methods. S. B.

155. Perfection of Chromic Acid Method for Determining Organic Carbon. J. W. White and F. J. Holben. *Ind. Eng. Chem.*, 1925, 17, 83.

The authors have made a study of this method and show that with a boiling mixture of sulphuric and chromic acids oxidation is complete.

The apparatus employed consisted of a Knorr's flask preceded by a gas washing bottle containing 50 per cent. potassium hydrate solution and a sulphuric acid-pumice drying tube.

Following the flask the train consists of six U tubes, the first containing glass wool soaked with sulphuric acid to retain the acid fumes evolved.

The second tube contains glass beads soaked with a saturated solution of silver sulphate. The fourth and fifth tubes are weighed and contain soda lime and sulphuric acid pumice respectively, the sixth tube acting as a soda lime guard tube and the usual form of aspirator employed.

0·2 to 3 gms. of material are weighed into the flask, 10 c.c. of chromic acid solution (400 gms. chromic anhydride in 1 litre of water) added, followed by 50 c.c. sulphuric acid (sp. gr. 1·83). The solution is brought to boil for 30 mins., during which time 1·5 litres of carbon dioxide free air is aspirated.

The weighed tubes are detached and reweighed after an interval of 15 minutes, the weighings in each case being carried out with counterpoise tubes of similar size. S. B.

156. Testing and Adjusting the Binocular Microscope, and Suggestions on the Use of Microscopes in General. Marcus I. Goldmace. *U.S. Geo. Survey. Bull. Am. Assoc. of Pet. Geologists.* Jan.–Feb., 1925.

The chief point noticed is the question of eye-strain. The binocular microscope if well adjusted should remedy this evil. The two tests and adjustments considered sufficient are as follows:—

(1) Concentricity of the fields of the two tubes. (2) Paralleline of the prisms in the two tubes.

The methods employed are minutely described, and this short paper should be invaluable to those who are forced to work steadily with the microscope, and who wish to protect their eyes.

A third point mentioned is the importance of protecting the eyes from other light than that coming through the microscope—a very complete protection is obtained by cutting one side out of a box and cutting a hole in the bottom that will fit over the top of the microscope, leaving the open side of the box towards the observer, so that he can insert his head.

Too much illumination of the field itself should be avoided.

These useful recommendations have been approved by I. C. Gardner, Chief of the Optical Instrument Section, U.S. Bureau of Standards.

A most important paper, especially for young geologists, with due regard for their eyesight.

J. E. M. H.

157. The Carbon Residue Test for Lubricating Oils. W. M. Seaber. *Industrial Chemist* **1** (2) 79.

The author discusses briefly the oxidation and carbon residue tests for lubricating oils in relation to the carbonaceous deposit produced in the combustion space of an automobile engine. An improvement on the well-known Conradson Test is described in which the heating of the oil under test is carried out in an electrically-heated oven with good temperature control. A temperature of 900° F. is suggested as a convenient maximum.

Data are given of the carbon residues left by three oils at various temperatures between 750° and 950° F. At temperatures much below 800° the residues are asphaltic in nature and soluble in carbon disulphide.

R. W. L. C.

158. Analysis of Oil Wax Mixtures. L. D. Wyant and L. G. Marsh. *Oil News*, 1925, 17, 38.

The method developed in the laboratory of the Bureau of Mines consists in refluxing 5 gms. of the sample with 35 cc. of acetone until all dissolved or completely liquefied. The solution is transferred while hot to a 120 c.c. test tube, 15 c.c. of acetone being used to wash out the flask. The solution is shaken vigorously, allowed to cool to 60° F. and filtered. The filter consists of a tapered cylindrical tube containing a piece of monel metal gauze of very fine mesh, immersed in a water bath maintained at 60° F. Two lots of 15 c.c. of acetone are used to wash out the test tube and a final wash of 20 c.c. poured into the filter, allowing each wash to drain through before adding the next. Suction is applied to the filter flask to dry the filter.

The filtrate is then distilled to remove and recover the acetone and the oil dried in vacuo in a boiling water bath until free from acetone and weighed. The difference in weight from the sample taken gives the amount of wax precipitated. This can be recovered from the filter, also dried in vacuo, and its melting point determined. It is essential that the acetone solution should be shaken while cooling to 60° F., otherwise the wax separates in a mass which is difficult to wash. Care should also be taken that no water is present in the sample or the acetone as the solvent power is thereby reduced.

S. B.

159. Improvements in and Relating to Apparatus for the Quantitative Determination of Hydrogen Sulphide in Illuminating and other Gas. Humphreys & Glasgow Ltd., (W. H. Fulweiler). E.P., 227,039. 12.5.24.

The apparatus provides means for passing a definite quantity of the gas for examination over reagents which are differently reactive to different concentrations of hydrogen sulphide.

A vertical glass tube is connected at the lower end to a manometer and stop cock, and contains a strip of filter paper which has been previously spotted with the solutions of the indicators. These are in the order of sensitivity :—

1. Saturated aq. sol. of Silver sulphate.
2. 5 per cent. aq. sol. Copper sulphate.
3. 3 per cent. aq. sol. Anitmony trichloride.
4. 5 per cent. aq. sol. Cadmium chloride.
5. 3 per cent. aq. sol. Mercuric chloride.
6. 3 per cent. aq. sol. Bismuth trichloride.

The indicators are applied to the strip of filter paper by means of a comb with equally spaced teeth after dipping into the respective solutions.

The gas is passed through the apparatus at a constant rate of five cubic feet per hour for a period of one minute, and the concentration of the hydrogen sulphide in the gas is shown by the colouration of various indicators, *e.g.*, the silver sulphate will show under these conditions 1/10 grain H_2S per 100 cu. ft., copper sulphate 1/3 grain, and the others, 1, 2, 6 and 12 grains H_2S per 100 cu. ft. respectively. The method is therefore limited to concentration of 1/10 grain to 12 grains per 100 cu. ft., above which concentration the ordinary methods of determination must be used. S. B.

160. Improvements in Filters. Jenace Glaswerk Schott & Gen. E.P. 218,286.

The filter for use with highly corrosive liquids consists of a porous body of fritted glass particles fused into a vessel of non-porous glass. This is possible when the glass bodies have the same thermal coefficient of expansion. S. B.

161. Improvements in. and Relating to, Indicating Services for Automatic Gas Analysing Apparatus. M. M. Bock. E.P. 217,242.

Consists of an indicating or signalling device for self-acting apparatus working on the absorption method, with a pointer actuated by a submersible bell. When the bell moves in one direction a contact gives a greater or smaller number of current impulses according to the distance through which the bell moves. These impulses move a disc attached to which a pawl and ratchet arrangement allows it to return to new position by means of a releasing magnet. S. B.

Refining.

162. Treating Pressure Distillate with Clay Works at Barnsdall Plant. By Paul Truesdell. *National Petroleum News*, Feb. 11th, 1925.

In this article, the process, developed by T. T. Gray, of treating pressure distillate in the vapour phase, is described. It is stated that the process produces a water white gasoline at a smaller cost than acid treatment, and removes gum forming compounds from gasoline. It does not however, eliminate the necessity for re-running and sweetening the pressure distillate.

The original distillate is first redistilled, and the vapours passed through a bubble tower into the Gray vapour treating tower. The latter is cylindrical and mounted on structural steel supports. An inner tower, having a conical bottom fitted with a man hole for emptying purposes, contains the fuller's earth. The clay used is atapulgas clay of 60–90 mesh fineness. The bottom plates of the fuller's earth container are perforated with a number of small holes suitably screened. The top of the inner tower is open and considerably lower than the roof of the outer one. Suitable heavy lagging serves to maintain a high temperature in the clay. The vapours are led into the outer tank through a vapour line, are forced upwards to the roof, and then downwards through the clay. The treated vapours flow out at the bottom of the tank, the polymerised products being discharged through the perforations to the still. In addition, any consensed vapours are also refluxed back to the still. It is said that the clay polymerises the gum-forming and colouring compounds forming a red, yellow, or brown liquid of high viscosity and specific gravity. The clay can be regenerated by roasting in a rotary furnace and is used as many as four or even five times. W. H. T.

163. The Manufacture of Silicic Acid Gels. Farbenfabriken vorm. Friedr. Bayer u. Co. E.P. 205,081.

A silicic acid gel may be prepared by subjecting a jelly, obtained by the interaction of a concentrated solution of an alkali silicate with an acid, to a pressure of at least 100 atmospheres. The washing of the gel may take place before or after pressing. The opalescent mass obtained is dried in a vacuum or by heating to 200° C. S. F. B.

164. Improvements in the Treatment of Liquids. E.P. 198,373.

This invention consists of a process of treating liquids with a plurality of activated decolorising carbons of different types which exert a complementary action. Its chief object is to achieve, by the least possible quantity of material, the maximum effect, due regard being taken of the individual effects.

It is claimed that this is a process of treating liquids with a plurality of activated decolorising carbons of different types, exerting complementary action on substances to be removed, and each more active than ordinary bone-char or charcoal. They can be used consecutively or in a mixture. One or more types may be gas activated carbons of vegetable origin, showing fibrous structure. One carbon may possess high filtering power, and another high adsorptive power. These are applicable to the decolorisation, purification or refining of saccharine solutions or juices.

Also, one or more carbons may be impregnated or treated with substances capable of assisting reaction or preventing subsidiary reactions, *e.g.*, kieselguhr may be impregnated. It is a process of treating liquids with activated carbon which is more active than bone black and with extracted bone black, or mixtures of activated carbons of different types and complementary action, each being more active than bone-char or ordinary charcoal. A. L.

165. Process for Clarifying Oil. U.S.P. 1,515,597.

This invention relates to processes for clarifying oil, its main object being to lessen the waste of oil in spent filter cakes.

It is claimed that by successively forcing air, steam, water and steam in this order, through cakes of fuller's earth impregnated with oil, this result is obtained.

Air, under pressure of 15 lb. per sq. in., is forced through for 15 minutes at ordinary temperatures. Next, steam is forced through at 70—100 lb. per sq. in. for about 30 minutes, followed by water at 40 lb. per sq. in. at a temperature of 200–212° F. for 60 minutes. Finally, steam is again forced through for about 30 minutes at 70–100 lb. per sq. in.

A. L.

166. Improvements in and relating to Treatment of Liquids. E.P. 225,891.

This invention relates to improvements in active carbons and in treatment of liquids by such.

Activated carbon is treated with a limited quantity of acid solution, which is all retained in the carbon to yield a product which contains all the natural ash.

Air-dry activated carbon is treated with a gaseous acid, or a substance such as chlorine, which causes liberation of acid after activation is complete.

Gaseous acid may act upon alkaline or alkaline gas activated carbon. The dry activated carbon can be treated as it cools on leaving the activating furnaces. Oils and fats are treated by this material. They may be treated with this material mixed with another absorbent, such as bleaching earth

The liquid to be treated may first be treated to neutralise fatty acids, *e.g.*, with alkali, or may first be treated with alkaline activated carbon. It may be treated with more alkali than is necessary to saponify the fatty acids and then treated with the acid carbon or mixture. NaOH may be used to neutralise the fatty acids, and then Na_2CO_3 solution added.

The carbon may be prepared by atomising into it an acid solution. A gas activated carbon showing the structure of its derivation may be used. Acid may be added to the carbon till it is nearly neutral. The quantity of acid usually employed varies from 0.1—5.0 per cent. The carbon may also contain from 2—7 per cent. HCl. A. L.

167. Improvements in and relating to Processes for the Production of Active Carbon. E.P. 228,954.

This invention relates to an apparatus for the production of activated carbon from carbonaceous materials.

There is described an apparatus consisting of a rotating furnace situated within a gas tight casing, with suitable driving mechanism arranged outside the casing. The raw material is fed in at one end and the activated carbon withdrawn into a chamber from which air is excluded. The inside of the furnace may be fitted with ribs to carry the material up and then allow it to fall in a shower through the activating gas. The furnace may be made of a diameter small enough to allow heating by radiation from the sides. The pressure inside the casing may be kept higher than atmospheric, or the pressure inside the furnace or retort maintained higher than atmospheric. Heating may also be effected by combustion of a gas inside the retort.

A. L.

168. Treatment of Diatomaceous Earth. E.P. 229,021.

This invention relates to the treatment of infusorial earth or kieselguhr, by which its quality is improved particularly with regard to its use as a clarifying agent.

The finely divided earth is mixed with a finely divided salt of an alkali metal, such as NaCl, in the dry state, or treated with an aqueous solution of the salt, and the mixture so obtained is calcined at temperatures above the melting point of the salt. Partial sintering of the finer particles is effected, and the result is that there is obtained a material of less density and higher porosity. Five per cent. of NaCl may be used and the mixture calcined at 1800° F. The resulting material has also the advantage of being pure white. If desired it may be milled after calcination. The filtering efficiency of this product is high, and it also may be used in insulating material preparation, and as an ingredient in soaps, paints, etc. A. L.

169. Process and Apparatus for the Mechanical Production of Colloidal Substances. E.P. 216,110.

This invention refers to the comminution of solid substances by mechanical means, especially to the dry state, in an economical way, without addition of dispersing agents or protective colloids.

It is claimed that the substances suspended in a liquid are reduced to the colloidal state in a disintegrator without addition of dispersing agents and directly transferred by means of an atomising device into a drying apparatus.

The disintegrator is preferably a combination of a conical runner provided with straight or helical grooves and a casing similarly grooved. The feed is in a tangential direction, and brought about by helical blades fixed to shaft of runner. The exhaust is on the same principle.

The nozzle-shaped outlet leads to a chamber into which a nozzle fed with hot compressed air or gas projects. This throws the liquid on to a baffle

J

plate fitted in a drying chamber. It is thus atomised and dried instantaneously. The hot air nozzle acts as an injector and facilitates running of the mill. A. L.

170. A Process for Increasing the Porosity of Decolorising Charcoal. E.P. 202,639.

This invention provides a process for increasing the porosity of known forms of charcoal, *e.g.*, bone black, etc., and thus increasing its adsorptive faculty.

It is claimed that when a mixture of one or more inert gases, *e.g.*, waste gases from furnaces, and just sufficient oxygen to cause oxidation of the carbon particles without flame formation, is led over such charcoals at temperatures above 500° C., greater porosity is attained without injury to the skeleton of the charcoal. A. L.

171. An Improved Process for Drying and Coating Porous Materials for Use as Adsorbents and Catalysts. E.P. 222,279.

This invention provides a process for removal of water from finely-divided or porous materials, and coating both internal and external surfaces with a protective and catalytically-active film.

It is claimed that by bringing the material into contact with a liquid or its vapour which will "wet" the surfaces preferentially to water, and removing excess liquid by means such as distillation, a dehydrated material is obtained, with a protective film which is also active. A further modification is the use of insufficient treating liquid and subjection of the material to temperatures which will produce such a film upon the surfaces. Also a substance capable of emulsifying water in the treated liquid is added to the treating liquid, this substance being contained in the coating film left after removal of excess treating liquid. The residual coating film may also be decomposed and removed in gaseous form. A. L.

172. Improvements in the Manufacture of Adsorbent Materials. E.P. 222,423.

This invention consists of preparing an adsorbent material, by precipitating under certain conditions an insoluble alkaline earth-salt and depositing on this precipitate another adsorptive alkaline earth metal salt. A cheap salt may be used and a relatively more expensive one used as a deposit. For example, $CaCO_3$ may be precipitated and then a small quantity of phosphoric acid added. A surface layer of diphosphate is thus produced. This material has decolorising and ash-removing capacities.

Precipitation can be carried out in presence of alkali metal hydroxide or carbonate. A temperature over 80° C. may be employed.

The precipitated salt may be acted upon by an acid. It may be washed with a solution of impregnating material. Certain substances, such as sugar and tannin, may be used to prevent adherence of precipitated particles.

Gases and liquids can be treated with such suitable composite materials. A. L.

173. Improvements in the Manufacture of Adsorbent Materials. E.P. 222,159.

This invention relates to improvements of processes for preparing precipitates having adsorptive properties. For clarifying liquids, due balance between the adsorptive properties and the capacity of the solid for separation by filtration is necessary for efficiency. More or less insoluble calcium salts are concerned, *e.g.*, the carbonate, phosphate, sulphate, but not necessarily limited to these. They may be used wet, or after the mother liquor

is wholly or partly removed, or after washing and drying, the drying being carried out at low or high temperatures, rate variable, and under varying pressures.

It is claimed that an absorbent material may be prepared by converting CaO in $Ca(OH)_2$ into any insoluble Ca salt by treatment with an acid in presence of an alkali metal salt, added as such or as hydroxide.

The conversion to Ca salt is obtained by use of excess of alkali metal salt and the hydroxide of alkali metal so found is separately treated with acid for regeneration of salt. Gaseous acid may be used.

Conversion to Ca salt is carried out at temperatures over 80° C.

Preparation of Ca salt is effected by acting upon milk of lime and zinc with gaseous acid in the presence of corresponding alkali metal salt or hydroxide at temperatures over 80° C.

Milk of lime is treated with large excess of alkali metal carbonate at temperatures over 80° C., removing alkaline liquor and reforming the alkali metal carbonate with CO_2 at ordinary or high temperatures.

A Solution or suspension of CaO or $Ca(OH)_2$ containing dissolved alkali metal compound is injected into atmosphere of gaseous acid.

Superheated steam is employed in above.

A protective agent is added to prevent adherence of particles to each other, *e.g.*, gelatine.

Flue gases are employed for reaching desired temperatures and with superheated steam. A. L.

174. Method and Mechanism for Dehydrating Minerals. William Rogers Wade and New York Zinc Co. Inc. E.P. 213,561.

The method is primarily intended for dehydrating zinc ore-pyrite concentrates. The apparatus consists of a furnace connected with a stack by a flue, through the centre of which runs a compressed air pipe. This pipe, heated by the flue gases, discharges through a nozzle about half-way along the flue at a point just in advance of a hopper, through which mineral is dropped into the flue. The mineral is carried along by the hot air and effectively dehydrated on its way to the stack. The latter, being of large cross section, allows the air to expand and so deposit the dried material, which falls through the open bottom of the stack. C. V. H.

175. Improvements in the Production of Materials for Purifying Oils. Paul Wyckoff Prutzman and Carl Johann von Bibra. E.P. 227,177.

Mineral earth of the Montmorillonite type is mudded with water and then treated with acid (preferably sulphuric acid) to eliminate soluble ingredients. The acid is removed by water-washing, and the excess water withdrawn. The earth, in its muddied condition, is then mixed with the oil to be purified and heated to 250° F. to evaporate the water and allow the oil to come into intimate contact with the solid particles.

This method, which is particularly suitable for petroleum lubricating oils, serves both to decolourise and to neutralise. It is cheaper than the usual method because the drying and crushing of the earth is dispensed with; and, since the earth remains wet until actually in contact with the oil, it does not absorb gases from the atmosphere and so reduce its efficiency. In consequence, the method requires only half the usual quantity of earth.
C. V. H.

176. Revivifying Fuller's Earth. R. E. Wilson. U.S.P. 1,520,493.

Fuller's earth which has become spent may be revivified for further use by causing local combustion to be set up in a portion of a bed of the material

and then spreading the path of combustion by forcing air into it. The temperature is controlled by admixture of flue gas to the air. S. F. B.

177. Process of Preparing Fuller's Earth. C. C. Rupprecht. U.S.P. 1,524,843.

Fuller's earth is freed from moisture and then treated with a colloidal solution so that the pores are filled with colloid. It is then dried. T. A. S.

178. Refining Petroleum. R. Cross. U.S.P. 1,515,733.

A deposit of copper, iron, lead, manganese, zinc or other metallic salts which have an affinity for the sulphur compounds present in the oil, on a highly absorbent material such as bentonite, may be employed to refine petroleum. S. F. B.

179. Purifying Hydrocarbon Distillates. H. D. Demoulins and F. H. Garner. E.P. 216,918.

Hypochlorite or other alkaline solutions containing oxidising agents may be employed in desulphurising hydrocarbon distillates, including cracked distillates, in the vapour phase. The refining agent may be sprayed into the vapour at the outlet end of a dephlegmater, fractionating column or scrubber. The hydrocarbons may be partially purified by means of sulphuric acid previously. S. F. B.

180. Chlorinating Hydrocarbon Gases. E. H. Payne and S. A. Montgomery. U.S. 1,520,506.

Chlorination of the hydrocarbons present in pressure still gases from cracking, takes place when they are treated with chlorine at a temperature of about 150° in the presence of a porous catalyst, such as the solid product obtained by treating high-boiling oils with chlorine. The liquid chlorination product boils between 55–193° and has a specific gravity of approximately 1·364. S. F. B.

181. Removing Sulphur from Petroleum Distillates. L. M. Clark. U.S. 1,521,278.

Petroleum distillates containing a high percentage of sulphur are treated with sulphuric acid (66° Bé.) and then redistilled to leave a residue having a high sulphur content. This is then treated with a further quantity of acid of the same strength and the process repeated to obtain a spirit of minimum sulphur content. S. F. B.

182. Apparatus for Treating Hydrocarbon Oils. G. Egloff and H. P. Bennet. Assr. to Universal Oil Products Co. U.S.P. 1,524,818.

A still is fitted with an internal flue carrying hot gases. Oil is fed into the annular space through a plurality of nozzles situated near the heating flue and unvapourised oil is withdrawn at the rear of the still. Vapours are taken from the still, through a dephlegmator, to a condenser. T. A. S.

183. Apparatus for Refining Hydrocarbon Oils. U. F. Clemons. U.S.P. 1,523,053.

An oil still is fitted with a large dome carrying a bed of fullers earth through which the vapours have to pass. A pan is suspended beneath the dome to catch any particles of earth which fall through the perforated floor of the dome. T. A. S.

184. Art of Refining Oils. S. H. Diggs, Assr. to Standard Oil Co. U.S.P. 1,521,282–3.

A. Residual hydrocarbon oil is treated with sulphuric acid, and after removal of the sludge, is agitated with a suspension of slaked lime.

B. Oil is treated with sulphuric acid and, before removing the sludge fuming sulphuric acid is added. The combined sludge is then separated.

T. A. S.

185. Improvements in or Relating to the Clarification or Purification of Liquids. E.P. 225,635.

This invention provides a means of purifying such liquids as waste waters, effluents, etc., and refers especially to processes where the matter suspended is precipitated or separated by the use of organic substances capable of coagulation.

Alginates, with or without other agents, are added to the liquid, and before, during, or after coagulating, there is added, a solid, liquid, or gas to act mechanically in acceleration of the separation of the suspended coagulated matter. A solid, such as a mineral powder, is absorbed by the flocculent bodies and because of high specific gravity causes rapid settling. Gas may be introduced into, or generated in, the liquid, and in the form of fine bubbles, adheres to the flocculent bodies and causes them to rise. The gas bubbles may be generated chemically or by electrolytic action. To produce the same effect, the liquid to be treated may be passed through an emulsifier and part added to the liquid to be clarified.

Accelerating agents used may be such as have an electric charge which neutralises the charge on the particles suspended.

A. L.

186. Process for Treating Petroleum Emulsions. E.P. 225,617.

This invention provides a means of breaking Petroleum Emulsions, such as B.S., sludge, etc., by the use of any substance derived from fatty acids, and which retains their fundamental characteristics. The fatty acid may be modified by the action upon it of substituting chemicals, giving substitution or addition products, and the ester or salt of this used. *E.g.*, amino, sulpho-, nitro-, derivatives may be used. Esters and sulphonates, aromatic compounds of sulpho-fatty acids, sulphurised fatty acids, and the salts and esters of such are active in this respect.

The quantity required, it is claimed, is small, *e.g.*, from 0·0 per cent. to 1·0 per cent.

After introduction of the compound, the mass may be heated and allowed to stand, whereupon, separation is effected. If necessary, the mass may also be thoroughly agitated to better distribute the reagent. Depending upon the oil, different compounds will be found to have varying effects.

A. L.

187. Gasoline Filtering Compound. U.S.P. 1,523,547.

This compound is intended to purify gasoline which has been used to clean fabrics of all kinds, minor implements, etc., and consequently contains not only grease and oil, but also dirt and particles of all kinds as impurities.

The compound consists of a mixture of :—

NaOH—75·0 per cent.
Na_2SO_4—17·5 per cent.
Na_2CO_3—4·0 per cent.
NaCl—1·5 per cent.
Small quantity of water.

Also a composition of four chemical compounds of sodium, NaOH, in relatively large proportion, Na_2SO_4, Na_2CO_3 and NaCl each one-fourth of the quantity of its predecessor in the above order.

A. L.

188. Improved Process of Expelling Volatile Substances by Means of a Stream of Vapour. E.P. 224,431.

This invention provides an economical method for expelling volatile substances by means of a stream of vapour, *e.g.*, steam distillation. Its chief feature, is the method of separating the expelled volatile substance.

The vapours are circulated by a pump which increases the pressure, they condense and the layer of required substance is drawn off. The expelling vapour, now condensed, is used to cool the oncoming vapours and is in turn itself evaporated, after the pressure has been relieved.

A. L.

189. An Improved Process for the Treatment of Hydrocarbons, Particularly of Crude Petroleum. E.P. 191,037.

This invention relates to a process for desulphurisation of hydrocarbons, more particularly crude petroleum, by heating them with metal soaps, metal sulphides being precipitated, with stratification of the released fatty acids. *E.g.*, at temperatures between 100° and 110° C. complete chemical reaction takes place according to an equation such as this,

$$2C_{18}H_{31}O_2Na + H_2S = 2C_{18}H_{32}O_2 + Na_2S.$$

It is claimed that this reaction can be brought about during distillation of the petroleum and desulphurisation effected. Stratified fatty acids can be drawn off. Also when the process of desulphurisation ceases or slackens, a catalyser, such as an alkali metal or alkaline earth metal may be added. Small quantities of water may be added.

A. L.

190. Refining of Petroleum Oil. U.S.P. 1,521,278.

This invention is in accordance with a new method for providing a marketable product from inferior crude oil distillate with minimum refining loss and cost.

Advantage of the profound modification of the boiling point of the sulphur compounds which are not eliminated or thrown down in the sludge on acid treatment, is taken, and the process consists of division of the treatment into a plurality of steps.

It is claimed that by treating petroleum distillates of high S content with 66° Baumé H_2SO_4, separating treated oil, redistilling to leave a bottom of high S concentration, again treating distillate with 66° Baumé H_2SO_4 and distilling as before, a distillate is obtained with low S content and minimum refining loss.

For example, treat a distillate of crude Mexican petroleum with 66° acid—sulphur of distillate from crude being, say, 0·45 per cent. S—and leaving a bottom of 20 per cent. with high S content, again treating with 66° Baumé H_2SO_4 and leaving a second bottom of high S content. Acid used for each treatment may be—20 pounds per 40 gallons, or varied to suit requirements and S content.

A. L.

191. Method and Reagent for Dehydrating Oils. W. H. Kaul. U.S.P. 1,523,220. 13.1.25. Appl., 28.3.22.

A heavy viscous organic liquid having an affinity for water and a cresolic substance are mixed with oil emulsions. On standing the emulsions separate.

T. A. S.

192. Method of Treating Oil. W. H. Kaul. U.S.P. 1,523,219. Appl., 25.1.22.

Crude oil is intimately mixed with molasses and the mixture separated prior to distillation.

T. A. S.

193. Treating Asphalt. A. J. Rowland. U.S.P. 1,513,133.

A pliable product, which resists the action of most acids, can be prepared by air-blowing asphalt heated to about 150° for 3—4 hours, boiling the product first with dilute hydrochloric acid and then with water and finally reheating to 150°.

S. F. B.

194. Dehydrating Oil. V. C. Crites and K. A. Wright. U.S.P. 1,515,093.

Oil may be dehydrated by treatment with a hot solution of calcium chloride in water (1·35—1·6° Bé.). The process is suitable for dehydrating crude oils which contain both emulsified and suspended water.

S. F. B.

195. A New Method of Treating Alkali Sludge. Alfred Oberle. *Nat. Pet. News*, 1924, 16, No. 40–88.

The addition of dilute hydrofluoric acid to alkali sludge leads to the formation of sodium fluoride and liberation of the naphthenic acids. By causticisation of the sodium fluoride with lime, the caustic soda is regenerated and the fluorine recovered in the form of the calcium salt, which can then be reconverted into hydrofluoric acid by means of sulphuric acid. The loss of calcium fluoride for each cycle amounts to 8—10 per cent.

S. F. B.

196. Hydrolysing Acid Sludge from Petroleum Refining. W. N. Davis and G. A. Davidson. U.S.P. 1,511,721.

The acid sludge is mixed with water and just sufficient steam introduced to raise the temperature of the mixture to such a point that hydrolysis readily occurs (about 165—190°). The hydrolysis and separation of the sludge into acid and tar are completed under pressure (above 50 lbs. per sq. inch) in an insulated retort in which the heat of the reaction and the application of the necessary pressure maintain the hydrolysing temperature.

S. F. B.

197. Improved Process of, and Apparatus for, Separating a Gas from a Mixture of Gases.—Harold Wade, for the Silica Gel Corporation. E.P. 227,309.

This patent, which is a modification of E.P. 137,284, describes a continuous process for separating a gas or vapour from a mixture of gases or vapours by means of an adsorbent.

The adsorbent (preferably silica gel), which is used in a finely-divided state, is mixed with the vapours and blown through a reaction chamber fitted with a coiling coil. This latter also acts as a baffle to effect intimate contact between the vapour and adsorbent. It is at this stage that the adsorption takes place.

The mixture is then passed to a cyclone separator where the gel is collected in a hopper and fed by a screw conveyor into a heated chamber. Here the high temperature drives out the vapour from the pores of the gel which is thus reactivated; after passing through another separator it is collected in a hopper and fed back into the system, while the vapour is led away and condensed.

In this way the adsorbent is circulated in suspension in the gas stream with little mechanical handling, and since the system is a closed one, without loss. The process also provides a method of using several units in series in such a manner that the adsorbent is fed from one unit to another in a counter direction to the movement of the vapours. Thus the freshly activated gel comes in contact with the vapours just before they are discharged, while the fresh vapours, on entering, are met by the gel just before it is reactivated.

C. V. H.

198. Separating Oils.—E. M. Johansen. U.S.P. 1,520,953.

Mixture of hydrocarbons or similar oily mixtures composed of oils of different emulsifying capabilities may be separated by selective emulsification. The oils to be separated are emulsified by means of soap and the emulsified and non-emulsified portions separated.

S. F. B.

199. Improvements in Apparatus for Separating Liquids of Different Specific Gravities, Specially Applicable for the Separation of Oil from Water.—Bernard Daly Comyn and William Albert White. E.P. 227,544 of Oct., 1923.

The mixture of liquids (*e.g.*, oil and water) is led by a pipe to the bottom of a cylindrical receptacle whence it overflows into an outer concentric cylinder. This mode of entry into the apparatus minimises the pulsations of the pump and allows a steady flow to be maintained through the apparatus. From the outer vessel the mixture flows down a pipe to the bottom of a separating chamber, which it enters in several streams impinging upon each other in such a manner that their horizontal velocity is destroyed. The mixture then rises in the chamber and meets the inclined surface of a plate to which most of the oil globules adhere. As the oil collects on the inclined surface, the globules coalesce and rise up a narrowing passage to a weir which effects the separation. The water flows over a lower weir and passes through two successively larger separating chambers before finally leaving the apparatus.

C. V. H.

200. Improvements in, or Relating to, Methods of and Apparatus for Separating from a Mixture thereof Liquids of Different Specific Gravity.—Harold Montague Alexander. E.P. 227,518 of Oct. 16, 1923.

The mixture of liquids (*e.g.*, oil and water) is first subjected to a preliminary separation in any suitable apparatus. The water, still containing small quantities of oil, is delivered in an upward direction into another body of water through a number of pipes so arranged that swirling and eddy currents are avoided. The upward movement causes the remaining oil to rise to the surface where it is collected. The water is removed from the bottom of the apparatus and filtered before discharge.

C. V. H.

201. Separating Oil and Water or other Associated Liquids.—E. I. Dyer and A. R. Heise. U.S.P. (reissue) 15,871.

Associated liquids, such as asphaltic Californian petroleum, containing emulsified water, which are only separated with difficulty, are passed through a capillary medium under pressure and preferably after heating. A layer of infusorial earth supported by a cloth and screen, or perforated metal plate, forms a suitable medium and serves to effect coalescence of the emulsified particles. After such a treatment, separation is effected by gravity.

S. F. B.

202. Improvements in, or connected with, Edge Filters and like Apparatus.—E.P.'s 226,274, 226,275, 226,277, 226,278 and 226,470.

A variety of filters each consisting of a pile of cored laminæ of paper or other suitable material are described. The liquid to be filtered is supplied under pressure to the core of the pile of laminæ, which retains on its edge surface the particles of matter to be separated. The construction of the filters is such that cleaning may be effected by special tools thrust into the core, without altering the conditions of pressure or the adjustment of the laminæ. R. W. L. C.

203. Baffle for Centrifugal Oil Separator.—R. J. Pabodie, Assr. to Griscom Russell Co. U.S.P. 1,522,903 of Jan. 13, 1925. (Appl. Feb. 18, 1920.)

A tubular chamber is fitted with a helical baffle and a centrally disposed tube for the removal of purified oil. The liquid entering the separator receives a centrifugal motion imparted by the baffle, the heavy liquid passing out of the tubular chamber at the bottom whilst the light oil is discharged through the central tube. T. A. S.

204. Improved Filtering Apparatus for Liquids.—John, Thomas, and Joseph Brandwood. E.P. 227,343 of May, 1924.

In filtering dye or analogous liquors, a filter is used consisting of two concentric perforated cylinders with the annular space filled with sand under mechanical pressure. The liquor is passed, by pressure or vacuum pump, through the sand into the interior of the inner cylinder and thence to storage or use. The impurities, especially if they be coarse, are mostly arrested at the surface of the filtering mass and do not enter the sand. The filter therefore remains clean and efficient. C. V. H.

205. Improvements in the Refining of Oils and Fats.—E.P. 224,928.

This invention provides a modified method of refining oils and fats, containing free fatty acids, especially for edible purposes, without the use of alkali.

The oil or fat, which may be, for example, crude palm kernel oil with 5 per cent. free fatty acid, is subjected to the action of acid treated bleaching earth, whereby there is removed precipitable or coagulable impurities after filtration. The free fatty acids are then eliminated, along with odoriferous substances, by passing steam through the heated purified oil, the surface of which is maintained under very low absolute pressure. Air is excluded until the oil is cool. Depending on the nature of the oil, temperatures between about 245°C. —285° C. give good results under a vacuum of 1 inch of Hg. In the case of the above-mentioned oil it is practicable to reduce free fatty acid to 0·01 per cent. Special apparatus must be used to withstand the degree of vacuum, and action of acids under prevailing conditions. "Y" alloy is recommended. Al., 92·5 per cent.; Cu, 4·0 per cent.; Ni, 2·0 per cent.; Mg, 1·5 per cent. A. L.

206. Dephlegmator. U.S.P. 1,519,719.

The purpose of this invention is to provide a dephlegmator in which all parts subject to incrustation or breakage are easily accessible without dismantling of the apparatus, and by which it is possible, by regulating a water and steam supply, to arrive at the required distillate.

It is composed of a column, with superimposed cooling compartments, each with a group of superposed horizontal tubes, for carrying a cooling fluid; a combined vapour and condensate chamber arranged between the cooling compartments and open to them. Condensate formed on the tubes showers down upon the vertically rising vapours. Means for heating the condensate in the vapour chamber are provided.

The ends of the cooling compartments are fitted with movable covers to facilitate cleaning.

A plate is arranged between the vapour chamber and the upper cooling compartment, with an aperture to allow passage of vapour. A dish is supported below this plate, and is provided with apertures, preferably close to the edge. The bottom of the combined vapour and condensate chamber is formed of a horizontal plate with an upward projecting pipe, permitting vapour to rise into the compartment, and an outlet pipe is arranged for distillate, its upper end being below the projecting pipe. The lower portion of the column is provided with a dish having hollow legs for conveying condensate into the lower part of the column; an inverted U-shaped pipe extending through the bottom of the column, and having an inlet leg arranged near the bottom of the column, and a hollow inlet projecting upwards from this pipe, which permits condensate reaching a level above this to flow into it. A means for heating the lower portion of the column below the dish is provided. A. L.

207. Apparatus for Fractionation. U.S.P. 1,523,497.

This invention relates to a process for yielding sharp cuts during fractional distillation of mineral oils.

The apparatus consists of a still fitted with a dephlegmating column. In the column there are placed at intervals deflector members, having their peripheries in liquid-tight contact with the wall of the shell, and extending downwards and inwards to openings. The packing material is vertically continuous through the said openings. A vapour line leads from the top of the column to a condenser. Means for returning discharged condensate to the tower above the packing are provided. Thermometers, one placed at the bottom of the column and the other at the top, afford a means of regulating the quality of the distillate. A. L.

208. Apparatus for Separating Composite Oils into Component Parts. U.S.P. 1,520,161.

This invention is based on the principle that petroleum distillate, allowed to mix again with the original mass of oil, requires more heat to redistil it from the latter than to redistil it separately.

A battery of main stills is connected in series, and made to run with continuous feed. Inside each still of the series is fixed an auxiliary still, just above the oil level, and heated by the oil vapours at the surface. This second lot of stills is also connected in series. Distillate, condensed in the separators or columns, instead of refluxing to the oil in the main still, is made to run into the auxiliary still, where it is redistilled. By this means the yield of lighter products is increased and a reduction in the use of fuel realised. A. L.

209. Process of Increasing Efficiency of Distillation. H. E. Deckebach. U.S.P. 1,520,121, 23.12.24. Appl. 23.6.20.

Hot crude oil is withdrawn from a still and mixed with steam and distillate obtained from the still. It is then discharged again into the still above the body of crude oil. T. A. S.

Pure Chemistry.

210. The Production of Synthetic Carbon Compounds from Mixtures of Carbon and Hydrogen. *Chim. et Ind.* Feb., 1925.

To a nation situated as France is, both politically and economically, the transformation of solid combustibles into liquid is of the utmost importance.

The present article has for its object the presentation of the actual state of our knowledge.

Production of CH_4.—Sabatier showed that hydrogen can reduce CO to give CH_4 in presence of finely divided metals. Amongst the hydrogenating metals, Ni, Co, Pd, Fe, Pr and Cu, he found that the first three effect this at ordinary pressures, Pd at ordinary temperatures, Ni at temperatures about 180°–200° C., Co at 270° C. Fischer showed that Fe, at several dozen atmospheres, and at a temperature about 400° C., causes reaction. $2CO+2H_2=CH_4+CO_2$. Cu remains inert with gas mixtures at 200 atmospheres and temperatures up to 550° C. Pure metals known as hydrogenating agents do not seem to produce liquid products from mixtures of $CO+H_2$.

Production of a Complex Liquid by Binary Catalysts.—"Synthol." The above is not the case when a strong base is added to these metals. Fischer produced, from mixtures of $CO+H_2$ under pressure, CH_4, CO_2 and a liquid, partly aqueous and partly oily. This, at temperatures of about 400° C. and pressures of 70–150 atmospheres. Duration of contact aided production of oily products. The complex liquid consisted of alcohols, aldehydes, ketones, acids. The C atoms in the compounds were of the order 8 or 9. He produced from this an oil, over 0·8 S.G.; C.V.–7500–8200 cals. per gm. This mixed with benzol or alcohol could be used as a fuel for a motor-cycle engine.

Mechanism of Formation. Fischer's View.—An intermediate stage was found to be formaldehyde—

$$\begin{cases} 2CO+2H_2=2COH_2 \\ 2COH_2 = CH_4+CO_2 \end{cases} \quad \text{or} \quad \begin{cases} CO+H_2=COH_2 \\ COH_2+2H_2=CH_4+H_2O \\ CO+H_2O=CO_2+H_2 \end{cases}$$

Paraformaldehyde heated at 400° C. under a pressure of 100 atmospheres, in contact with pumice, impregnated with

$$K_2CO_3, \text{ gave } CH_2OH.2COH_2=CH_2OH+CO.$$

Next there takes place the following reaction: $CO+R.OH=2CO.OH$. Acids thus formed give in turn aldehydes, etc. The change goes no farther than compounds with C_2 or C_3, perhaps due to cracking.

He found that in one passage of the gas through the tube the yield by weight was 7–8 per cent. Gas passing from the tube, freed from the liquid formed, could be used again. A yield of 25 per cent. was obtained, the gas being passed in closed circuit. Fall in pressure ultimately stopped the reaction. However, this process has the double disadvantage of resulting in products which are partly unstable and that the working temperature, 400° C., is so near the limit beyond which resistance to breaking down rapidly diminishes.

Production of Pure CH_2OH.—La Société Nationale de Recherches showed that practically pure CH_2OH could be obtained from mixtures of CO and H_2, the catalyst used being the lower oxides of certain elements. By "lower oxides" is meant the oxide corresponding to the more feeble valencies. For example, the following elements form such oxides, spontaneously oxidisable to higher oxides—Cr, V, Mo, Tu, U, Pb, Bi. Voorhees found that the most active hydrogenating agent known was the product of reduction of the oxide of platinum obtained by adding to chloroplatinic acid an excess of $NaNO_3$.

The preparation of these oxides presents a difficulty, due to the fact that they are spontaneously oxidisable to higher oxides and that hydrogen does not effect the reduction of, say, Cr_2O_3, or V_2O_3, except at temperatures which cause the catalyst to lose a good deal of its activity. However, it has been shown that if, at 200° C. and 200 atmospheres, an intimate mixture of a hydrogenating metal, such as Cu or Ni, reduced from their hydrates, and an oxide Cr_2O_3 or TuO_3 is treated with hydrogen, water vapour is formed. Reduction to the metal state does not appear to take place. Again

it is necessary to employ such hydrogenating metals as do not themselves promote the reaction $CO+H_2$. Cu can be used as it does not react. Ni can be eliminated from the contact mass as its carbonyl.

Experiments were carried out having the catalyst, prepared in a manner similar to above, in a steel tube. A gas mixture, corresponding to the equation $CO+2H_2=CH_3OH$ was passed through under different conditions. An inner coating of Cu prevented formation of iron carbonyl. The nature of the transformation was found to depend essentially upon the temperature of the contact mass. From 225°–300° C. practically pure CH_3OH was obtained. A little water was present, about 0·5 per cent. Pressures used were 200 atmospheres. The issuing gas was practically the same composition as the ingoing gas. Beyond 300° C. parasitic actions set in, there being produced, besides CH_3OH, CH_4 and a complex liquid. Temperatures of 540°–560° C. gave a liquid, part of which had an alcoholic odour. Issuing gas showed a contraction of about one-third. A good deal of CH_4 was obtained. Under the most favourable conditions the yield of CH_3OH from one cubic metre of gas mixture was 40 grams. Alkalis were found to have the effect of producing complex liquids similar to the "synthol" of Fischer.

In conclusion, it is pointed out that these results have been obtained only in the laboratory and with strictly pure gases. Again, the fact that the catalyst is so easily affected by oxidising gases presents serious difficulties on a technical scale.

However, it has the advantages of giving rise to a 100 per cent. yield of a practically pure product. The working conditions allow a wide scope, and finally the reaction is exothermic, and thus the amount of heat to be applied is small. A. L.

211. Optical Properties of Hydrocarbons in the Ultra-violet Region. F. A. Hessel. Mat. grasses, 1924, **16**, 7010–7015.

Studies of the absorption in the ultra-violet region for $C_{16}H_{34}$ and $C_{16}H_{32}$ show that in the spectrophotometric curves there is a rapid and continuous increase in the absorption below $\lambda^m\mu$ 250, the maximum being outside the limit of the spectra. From the ultra-violet absorptions of several other hydrocarbons extending from C_6H_{14} to $C_{30}H_{54}$ it has been found that the extreme bands in this region can be calculated from the dispersion curves. For C_nH_{2n+2} and C_nH_{2n} hydrocarbons, the bands are approximately $\lambda^m\mu$ 150 and $\lambda^m\mu$ 163 respectively. S. F. B.

212. Refractrometric Investigation of Hydrocarbons. Y. Altchidjian. Mat. grasses, 1924, **16**, 6976–6981 and 7003–7006.

The author has reviewed the work carried out by previous authors on the refractrometric properties of hydrocarbons and their relation to the chemical constitution of these substances. The value of these properties in investigating the nature of petroleums is also discussed. The determination of the refractive index after the elimination of unsaturated hydrocarbons by mercuric acetate and after the elimination of aromatics by the usual methods is suggested as a means of determining the relative proportions of these substances present. S. F. B.

213. Napthenic Acids III. Naphthenic Acids Derived from Katsurané Kerosene Distillate. Yoshio Tanaka and Shoichiro Nagai. J. Faculty Engineering, Tokyo University. 1924, XV., 271–279 (No. 8).

The authors have isolated crude mixed naphthenic acids from the crude mixture of acid substances obtained on acidifying the waste-lye from the washing of the kerosene distillate from Katsuraná crude](Okita Prefecture).

This has been accomplished by two methods. In the first of these the crude mixture of acid substances was heated to 100–120° C. for 3–4 hours in the presence of 1 per cent. of copper oxide, which obviates the injurious effects of the sulphuric acid liberated by the alkyl sulphuric acids on decomposition. The viscous oil left was extracted by petroleum ether (b.p. below 60° C.) and the naphthenic acids obtained on evaporation of the solvent freed from neutral substances by conversion into the potassium soaps and extraction with petroleum ether. The acids were regenerated from the soaps by acidification. The second method employed consisted in diluting the acids with petroleum ether (1·5 volumes) and adding alcohol in small amounts until two layers formed. The upper layer contained the acids dissolved in petroleum ether, a further quantity being obtained on repeating the extraction of the lower layer with more petroleum ether. The crude acids obtained on evaporation of the solvent were purified through the potassium soaps as before. The crude acids had: $d_{4^\circ}^{15^\circ}$ 0·9747; $n_D^{15^\circ}$ 1·4796, an acid value of 231·8 and 83 per cent. of the mixture boiled between 170°–220° at 8·9–9·0 mm. The methyl esters obtained on methylation of the crude acids had: $d_{4^\circ}^{15^\circ}$ 0·9470; $n_D^{15^\circ}$ 1·4676 and 70 per cent. distilled between 130°–180° C. at 8·9–9·0 mm. On hydrolysis of the esters the pure naphthenic acids were obtained. These possessed the following properties: $d_{4^\circ}^{15^\circ}$ 0·9766; $n_D^{15^\circ}$ 1·4790, an acid value of 230·2 and 86 per cent. distilling between 170°–220° at 8·9–9·0 mm. These results indicate that the naphthenic acids isolated from Kurokawa oil although having many similar properties are quite different and are probably isomeric with them. S. F. B.

214. Naphthenic Acids. VIII. Naphthenic Acids Derived from Niitsu Neutral and Light Machine-oil Distillates. Yoshio Tanaka, Shoichiro Nagai and Shinzo Ishida. *J. Chem. Ind. Japan*, 1924, **27**, 810–816.

The naphthenic acids from the waste lye obtained in washing Niitsu petroleum (Niigata Prefecture) resemble those previously isolated from the crude Kurokawa petroleum (c.f. Tanaka, *J. Chem. Ind. Japan*, 1922, **25**, 1031) in having a high density (above ·99) and a high viscosity. Acidification of the waste lye from the neutral and light machine distillates gives a mixture of crude acid substances amounting to 0·079 per cent. of the crude oil, and from this the crude naphthenic acids are obtained; the yield of these acids is poor, amounting to only 1·5 per cent. of the mixture. Roughly, 85 per cent. of the crude acids boils between 180°–230° at 8·9–9·0 mm; the physical properties of the mixture are: d_4^{15} 0·9937, n_D^{15} 1·4917 and the acid value 223·9. On methylation, the mixed methyl esters were found to have d_H^{15} 0·9631 and n_D^{15} 1·4792; 73·3 per cent. boiled between 159°–200° at 8·9–9·0 mm. Hydrolysis of the mixed esters gives a mixture of the pure naphthenic acids, 80 per cent. of which boils between 190°–230° at 8·9–9·0 mm. and has d_H^{15} 0·9902, n_D^{15} 1·4887 and an acid value of 226·1. S. F. B.

215. Pyrogenic Dissociation of Hexadecane. H. Gault and F. A. Hessel. *Ann. Chim.*, 1924, [x], **2**, 319–377.

Although the dissociation of hexadecane is noticeable at 390° C., hydrogen cannot be detected in the gaseous products below 540° C. Between 540° and 615° the percentage of this gas rapidly increases and is directly proportional to the temperature and length of the furnace employed but inversely proportional to the rate of flow of hexadecane. The same relationship holds good for the percentage of gaseous saturated products but for unsaturated

gases, and, between 470°–815°, the liquid products of the action the converse is true; the iodine numbers of the liquid produced as well as the percentages boiling below the boiling point of hexadecane are also bound by the former relationship, but again, the refractive indices and densities bear the reverse relations. Above 750°, however, the iodine values of the liquid products tend to decrease with increasing length of furnace. The tendency of the liquid products to dissolve in dimethyl sulphate is only appreciable above 685° when it was found to increase directly with the temperature and length of furnace but inversely with the velocity of flow of hexadecane. All these results lead to the conclusion that it is the terminal decomposition of the hydrocarbons that predominates. Thus, at 470° the chief action is the formation of ethylene and saturated hydrocarbons together with the elimination of methane and formation of higher unsaturated hydrocarbons,

$$CH_3\cdot[\cdot CH_2]_{14}\cdot CH_3 \rightarrow CH_3\cdot[\cdot CH_2]_{12}\cdot CH=CH_2+CH_4$$

which account for the presence of saturated gases in the products at this temperature. Under the influence of heat the higher olefines are converted into naphthenes. At 540° similar reactions occur, but to account for the presence of hydrogen a further decomposition, represented by

$$R^1\cdot CH_2\cdot CH_2\cdot CH_2\cdot CH_2\cdot R^2 \rightarrow R^1\cdot CH=CH_2+CH_2=CH\cdot R^2+H_2$$

is assumed to take place. Above 685°, the naphthenes formed in these reactions from the higher olefines are dehydrogenated and become converted into aromatic hydrocarbons with the consequent elimination of hydrogen.

S. F. B.

Extraction of the Isomeric Xylenes from Crude "Xylol." T. S. Patterson, A. McMillan and R. Somerville. *J.C.S.*, 1924, **125**, 2488–2490.

The treatment of coke-oven xylol with sulphuric acid (d 1·84) leads to the formation of *m*-xylene-4-sulphonic acid together with a little *o*-xylene-4-sulphonic acid in the acid layer. The addition of water to this layer precipitates the acids, but when these are decomposed with superheated steam pure *m*-xylene is obtained. *o*-Xylene is obtained pure by decomposition of the calcium *o*-xylene-4-sulphonate with sulphuric acid. The separation of the *o*- and *m*-xylene-4-sulphonic acids depends on the solubilities of the calcium salts, the solubility of calcium *o*-xylene-4-sulphonate in water increasing with rise of temperature whereas the solubility of the *m*-xylene-4-sulphonate decreases.

S. F. B.

216. Pyrogenic Decomposition of Hexadecene. H. Gault and Y. Altchedjian. *Ann. Chim.*, 1924, [X], **2**, 209–268.

At low temperatures the decomposition appears to commence between two singly linked carbon atoms at the extremity of the chain and at these temperatures the proportion of saturated products is highest. In view of this result which is in accord with the thermochemical theory it is implied that the hexadecene molecules lose both saturated and unsaturated carbon atoms from both ends of the chain, the relative proportions split off being determined by the respective amounts of energy holding these terminal atoms to the rest of the chain. At high temperatures, aromatic hydrocarbons and tar are produced, while intermediate between these two zones a series of more or less saturated hydrocarbons is produced. The latter tend to lose hydrogen and pass into the substances produced at the higher temperatures.

S. F. B.

217. Synthesis of Methyl Alcohol by Reduction of Carbon Monoxide. G. Patart. *Compt. rend.*, 1924, **179**, 1330–1332.

The circulation of carbon monoxide (1 vol.) mixed with hydrogen (1·5–2 vols.) over zinc oxide heated to 400°–420° at a pressure of 150–250 atmospheres

leads to the formation of a liquid consisting almost entirely of methyl alcohol and water at a cooling zone in the circuit. This zone should be cooled to at least 20° C. S. F. B.

218. Irreversible Catalysis of Unsaturated Cyclic Hydrocarbons. II. N. D. Zelinski. Ber., 1924, **57**, [B], 2055–2057.

*Cyclo*hexane and benzene are produced when *cyclo*hexene is passed over palladranised asbestos heated to 164·5° C. The action is irreversible since *cyclo*hexene cannot be produced from a mixture of benzene and *cyclo*hexane. Using the same catalyst, the three methyl-*cyclo*hexenes, as well as methylene *cyclo*hexane, are converted into toluene and hexahydrotoluene at 116°–118°. S. F. B.

219. Octahydroindene and its Behaviour Towards Catalytic Dehydrogenation. N. D. Zelinski and P. Borissov. Ber., 1924, **57**, [B], 2060–2061.

Hydrogenation of indene using palladranised asbestos (30 per cent.) leads to the formation of octahydroindene, which boils at 164·5–164·5°/765 mm. and has $d_4^{15·5}$ 0·8790, and $n_D^{15·5}$ 1·4711. The same catalyst at 300°–305° dehydrogenates it, tetrahydroindene being formed. This substance boils at 171–172°/757 mm. and has $d_4^{16·5}$ 0·9274 and $n_D^{16·5}$ 1·5153. Nickelised alumina can replace the palladranised asbestos in the dehydrogenation but at a slightly higher temperature (320°–325°) the pentamethylene ring breaks and aromatics are produced. S. F. B.

220. The Action of Ozone on Hydrocarbons with Special Reference to the Production of Formaldehyde. III. The Action of Ozone on Hexane. E. W. Blair, T. S. Wheeler and W. Ledbury. *J. Soc. Chem. Ind.*, 1924, **43**, 287–289.

Traces of water, carbon monoxide and dioxide, together with formaldehyde, acetaldehyde and higher aldehydes up to hexoic, fatty acids up to hexoic, and hexyl hexoate were obtained by the action of ozone on boiling hexane of the aldehydes, acetaldehyde predominated. S. F. B.

221. Purification of Crude Benzene. M. Dunkel. *Brennstoff-Chem.*, **5**, 265–268.

The results of previous work show that benzene can be considerably purified by heating to 150°–250° under pressure; the temperature could be increased and the pressure diminished without materially affecting the extent of purification. Recent work indicates that, providing the temperature is sufficiently high, the heating can be carried out at atmospheric pressure. The method consists in vapourising benzene into a stream of air passing through an electrically heated tube containing steel wool. The guming impurities are burned to water, carbon monoxide and carbon dioxide under these conditions. The most suitable temperature was found to be 500° C, no carbon being deposited on the iron, but above this temperature carbon is deposited. Toluene can be purified by a similar method, but decomposition occurs above 400° C. The method is not recommended for purifying crude solvent benzene. S. F. B.

222. Alcoholic Motor Fuel. D. O. White. U.S.P., 1,501,383.

A fuel suitable for internal-combustion engines is prepared from 98 parts alcohol, 1·75 part ether and 0·125 part each of phenol and ammonium chloride. The two latter substances lessen the carbon deposits in the cylinder. S. F. B.

223. Nitrochloro Derivatives of Open Chain Hydrocarbons. E. Bielouss. U.S.P., 1,519,017.

Mineral oil distillates of not less than ·882 gravity from a paraffinoid source are successively chlorinated and nitrated to produce products suitable for use in pyroxylin or varnish compositions. S. F. B.

Natural Gas.

224. Manufacture of Natural-Gas Gasoline. U.S.P., 1,523,313.

This invention is a process for producing wild gasoline from gas by the use of an active solid absorbent, and stabilising the product.

The gas is treated in such a way that the major portion of the butane and the less volatile hydrocarbons are absorbed. The absorbed material is liberated—*e.g.*, by passing superheated steam—and rectified to produce a vaporous and a liquid fraction, in such a way that each does not contain a substantial quantity of more than one hydrocarbon individual in common.

The solid absorbent is activated carbon. The liquid fraction produced does not contain any constituent more volatile than butane.

A gasoline produced by this method contained as much as 46·2 per cent. butane, the balance being pentane and less volatile hydrocarbons, and its vapour pressure was only 13 lbs./sq. in. at 100° F. A. L.

225. Improvements in Gas Purifiers. E.P., 226,364.

This invention brings about elimination of strains on the sides of the gas purifier, caused by expansion of the absorbing material, due to absorption of impurities.

It is claimed that by passing the gasses, either upwards or downwards, through a series of superposed grids mounted on joists in a box, in the usual manner, and providing on the sides of the box a series of solid annular abutments, room is provided for the usual expansion, and yet no gases are able to pass without passing through the grids and absorbing material.

A. L.

226. Process of Recovering Natural Gas Gasoline from Natural Gas. M. P. Youker, Assr. to Phillips Petroleum Co. U.S.P., 1,520,627 of Dec. 23, 1924. (Appl., Apr. 9, 1923.)

Hydrocarbon vapour is compressed until a portion is liquefied; the liquid being brought in contact with the hydrocarbon gas. Gasoline of desired volatility is thus obtained. T. A. S.

Lubricating Oils.

227. Reclamation of Lubricating Oil from Used Crank-Case Oil. F. H. Rhodes and H. J. Haon, Jr. *Ind. & Eng. Chem.*, 17, 25. (1925).

Portions of a considerable accumulation of used lubricating oil from the crank case of automobile engines were agitated with one of the following liquids:—water, solutions of alkalies, calcium chloride or sodium silicate (sp. gr. 1·2). The mixtures were passed through a high speed centrifuge and the light oil (kerosene) subsequently removed by steam distillation. Examination of the products showed that the most satisfactory reclaimed oil was obtained when sodium silicate solution was employed.

R. W. L. C.

228. The Chemistry of Lubrication. W. F. Seyer and S. R. McDougall. *Trans. Roy. Soc. Can.*, 1924, **18**, (Sect. III.), 35–48.

The authors have concluded from experiments carried out with a large number of fatty acids, paraffins and paraffin-derivatives that partial oxidation

of the unsaturated hydrocarbons in mineral lubricating oils might prove beneficial and improve their quality. The lubricating action of solutions is largely determined by adsorption.

S. F. B.

229. Reclaiming Lubricating Oil.—*Ref. and Nat. Gas. Mfr.*, **4**, (3), 35.

Figures are given showing that the installation of a continuous high-speed centrifuge system for treating the crank case oil in use on a plant comprising ten 160 h.p. gas engines resulted in a reduction of the average lubricating-oil costs per horse-power hour by 34 per cent. over a period of four months.

R. W. L. C.

230. The Effect of Crank-Case Dilution.—D. P. Barnard. *Ind. and Eng. Chem.*, **17**, 278.

The results of tests carried out on the crank-case lubricant of five cars, to determine the relation between dilution and wear, are discussed and plotted graphically. The lubricant used was a high-grade "medium" motor oil, 285 secs. Saybolt at 100° F. The test consisted of runs of approximately 500 miles on each charge of oil. Samples were taken at every 100 miles immediately after the car had been in service to minimise the effect of settling. The percentage dilution was deduced by a comparison of the viscosity of the crank-case oil with a curve obtained by viscosity determinations on samples of the original oil diluted with kerosene. The wear was determined by estimation of the amount of iron in the used oil.

Test runs of 7–10 hours' duration were also carried out on two engines connected to dynamometers, the viscosity of the lubricating oil being maintained substantially constant during each run by addition of fresh oil or kerosene as necessary.

Road tests under ordinary conditions in which wear is estimated from oil analyses, although indicating increased wear with dilution, are inconclusive, owing to settling of metallic particles.

Dynamometer tests show that the rate of wear increases more rapidly than percentage dilution, particularly above 10–15 per cent. dilution.

R. W. L. C.

231. Improvements in Automatic Apparatus of the Continuous Type for Purifying Industrial Oil.—E.P. 222,289.

Apparatus for continuously purifying turbine, steam engine and transformer oils, etc., is described. The apparatus comprises a settling tank containing inclined surfaces, an illuminated sighting device, which provides for observation of the flow of oil and a number of filtering elements, each of which may be separately dismantled for cleaning without interfering with the continuity of the process.

R. W. L. C.

232. Apparatus for Reclaiming Waste Lubricating Oils.—U.S.P. 1,518,684.

The apparatus, which is intended for reclaiming used crank-case oils, comprises a settling tank, a series of downwardly inclined evaporating pans with a heating unit beneath where gasoline and kerosene are eliminated, and finally a filter containing fuller's earth.

R. W. L. C.

233. Improvements in Lubricating Oil Emulsions.—E.P. 209,060.

Oil in water emulsions containing no emulsifying agent and possessing a high degree of stability is produced from mineral or tar lubricating oils, which have been preliminarily subjected to an electric glow discharge.

The stable emulsions can be produced by atomising the prepared oil with steam at a mixing nozzle.

The glow discharge for the preliminary treatment of the oil is produced by a single phase alternating current at a tension of 4300–4600 volts, and a frequency of 500 per second, between slowly rotating aluminium electrodes mounted on a horizontal shaft.

The apparatus is enclosed and is filled with hydrogen at a pressure of 65 cm. of mercury. The oil, heated to 60°–80° C., is projected by scoops between the electrodes. R. W. L. C.

234. Improvements in Lubricants.—E.P. 229,957.

A lubricant which will preserve its lubricating qualities for some time at a high temperature is prepared by incorporating the calcium soaps from a vegetable oil (castor oil) and a vegetable wax (carnauba wax) with graphite and a mineral oil of high flash point. R. W. L. C.

235. Improved Process and Apparatus for Recovering Cutting Oil from Metal Shavings and Chips.—E.P. 221,469.

This process of reclaiming oil from metal chips consists in feeding the chips continuously into an inclined rotating cylinder immersed in hot water. The oil rising to the surface of the water is floated off into a centrifuge and the chips withdrawn by a conveyor and discharged on to a draining platform.
R. W. L. C.

236. Improvements in Treating Oils, Waxes, etc.—E.P. 195,055.

The present patent concerns a specific development of E.P. 175,987.

This invention is concerned only with silica and metallic oxide gels, which have such pore size that they can absorb not less than 10 per cent. of their weight water at 30° C. when in equilibrium with water vapour at a partial pressure of 22 mm. Hard porous silica gel is the preferred adsorbing material. By its means petroleum products, such as gasoline and kerosene, containing more than 10 per cent. of unsaturated hydrocarbons and having a sulphur content of below 0·02 per cent., can be obtained. It is stated that these products are of such purity that they remain colourless indefinitely on exposure to light and air, and give a negative gum or copper dish test.

Plant is described for carrying out the refining process by a continuous counter current method. This plant consists essentially of alternate agitators and separators and an activator unit where the spent adsorbent is regenerated by water or steam. The adsorbed material is driven off and collected. The recovered adsorbed material is particularly suitable, by reason of its high percentage of unsaturated compounds, for use in the oil flotation process for recovering metals. R. W. L. C.

237. Improvements in Centrifugal Separators for Dehydrating or Purifying Oil.—E.P. 223,656.

In order to prevent the loss of oil as vapour and to obviate aeration, the discharge end of the delivery conduit of a centrifugal separator, to be used for purifying insulating oils, is extended to dip beneath the surface of oil contained in a reservoir provided with a constant level device.
R. W. L. C.

238. Improvements in Centrifugal Purifying and Dehydrating Apparatus.—E.P. 224,935.

Centrifugal apparatus of the usual conical disc type is improved for purifying insulating oils. The disc carrier or lowermost disc is not perforated, and

extends outwardly beyond the periphery of the superimposed discs. The whole of the oil passes in a thin film beneath this disc through a liquid seal of water or some reagent at the bottom of the bowl. R. W. L. C.

239. Art of Refining Oils.—U.S.P. 1,521,283.

This method of acid treating hydrocarbon oils intended for lubricants consists in subjecting the oil to the action of sulphuric acid in the usual manner, and subsequently, before removing the sludge produced, adding 4 to 25 per cent. (calculated on the weight of treating acid) of fuming sulphuric acid. The combined sludge is then separated. By this means a sludge which will stratify readily with hot water or hot weak sulphuric acid is obtained. A process for the recovery of tar and dilute sulphuric acid from the sludge is described. R. W. L. C.

240. Method of Manufacturing Lubricating Oils.—U.S.P. 1,525,016.

Economy is effected in the conventional process for manufacturing lubricating oils by the use of continuously acting high-speed centrifuge machines for the removal of any acid sludge which will not settle readily from acid treated oils. An alkaline solution or a solvent for the sludge is fed into the rotating bowl of the centrifuge, so that it does not come in contact with the clarified oil, but dissolves or combines with the sludge to form a mixture which will flow freely from the machine.

An illustration of a machine of the De Laval type with the necessary feed tanks is given. R. W. L. C.

241. Process of Preparing Mineral Wax.—U.S.P. 1,513,745.

Mineral waxes are extracted from earthy materials, such as hydrocarbon oil bearing Nevada or similar shale, by treating the shale with a boiling solvent, such as ethyl alcohol. The solvent is separated from the shale and cooled. The wax separates nearly completely and the solvent can be immediately used again.

Apparatus for carrying out the process is described. R. W. L. C.

Cracking.

242. Method for Treating Petroleum. C. P. Dubbs, Assr. to Universal Oil Products Co. U.S.P. 1,525,281 of Feb. 3, 1925.

Oil is passed through a coil in which it is heated to cracking temperature. It is then passed into an enlarged chamber where substantial vaporisation occurs. The vapours are passed into a dephlegmator where they are scrubbed with charging stock. The refluxed oil from the dephlegmator is again passed through the cracking tube. Unvaporised oil from the enlarged chamber is not passed again through the cracking tube. Light vapours from the dephlegmator are separately condensed. The cracking coil is maintained at super-atmospheric pressure. T. A. S.

243. Cracking and Hydrogenating Hydrocarbon Oils. Internationale Bergen-Compagnie voor Olie en Kohlen-Chemie. E.P. 216,882.

In cracking and hydrogenating oil by heating under pressure with hydrogen, the evolved gases are cracked to obtain hydrogen, which is returned to the reaction vessel. Other similar gases, such as coke oven or illuminating gas, may be mixed with the gases before treatment. S. F. B.

244. Producing Petroleum Products of Low Boiling-point. C. S. Palmer. U.S.P. 1,514,098.

High boiling oils, *e.g.*, fuel and gas oils, are passed through a heating zone under a suitably high pressure to prevent the formation of vapours, at a temperature sufficiently high to bring about decomposition of the oil. The cracked oil is then transferred through a cooling zone to a suitable vessel in which the pressure is reduced and the low-boiling products allowed to distil off. S. F. B.

245. Recovering Aluminium Chloride. G. L. Prichard and H. Henderson, Assrs. to Gulf Refining Co. U.S.P. 1,520,080 of Dec. 23, 1924. (Appl., Mar. 10, 1922.)

Aluminium chloride is recovered from sludges by heating the sludge in a thin layer on the surface of hot liquid with which it is immiscible. T. A. S.

246. Aluminium Chloride in Oil Treatment. F. W. Hall. U.S.P. 1,512,420.

The reaction products, both solid and gaseous, from the heating of alumina, carbon and chlorine together, form a suitable agent for the treatment of oils. S. F. B.

247. Aluminium Chloride recovery from Oil Residues. A. M. McAfee. U.S.P. 1,520,831.

The oil residues containing aluminium chloride are heated in the presence of air to remove most of the carbonaceous material by oxidation and the heating completed in the absence of air, to effect distillation of aluminium chloride from the residue. S. F. B.

248. Apparatus for Distilling Hydrocarbon Oils. U.S.P. 1,526,010.

This invention relates to the distillation of hydrocarbon oils, particularly to the pressure distillation of high boiling-point oils for the pyrogenesis of lower boiling-point oils.

The apparatus consists of a bulk supply container mounted on a still setting, fitted with downwardly inclined circulating tubes connected by headers. These tubes are placed in the heated zone. The headers are connected to the container. Into one of the headers is led a pipe for supplying, *e.g.*, an inert gas, under pressure. The gas is discharged through nozzles projecting into two or more of the tubes and, whilst maintaining the pressure in the container at a definite figure, aids circulation of the oil in the system. A residue run-off pipe is connected to the bottom of the longer header. The feed may be made down the vapour line from the container. A. L.

249. Alcohols from Petroleum. *Ind. Eng. Chem.*, Feb. 20, 1925.

A new vapour phase cracking process, according to the products desired, yields 40–55 per cent. of motor spirit with remarkable anti-knock properties: 10–12 per cent. of it added to ordinary gasoline is said to be effective in eliminating knocking. The process designedly yields a large volume of gas rich in olefines and other reactive hydrocarbons, which, by a certain process, can be made to yield different alcohols, *e.g.*, isopropyl, along with butyl, amyl and hexyl alcohols, these having a wide application in preparation of secondary products, and as solvents. A. L.

250. Art of Converting Oils. U.S.P. 1,525,916.

This invention deals with a method for converting hydrocarbon oils into lower boiling hydrocarbons.

The oil to be converted is heated to above 680° to 700° F. at such a rate that no substantial proportion is converted during this first heating. Pressure employed may be about 25 lb. per sq. in. This heating takes place in a confined passage. The oil is next passed into an enlarged chamber and maintained at a temperature above 680° to 700° F. The oil in this chamber is maintained at a pressure of about 75 lb. per sq. in. It is kept in this chamber until substantial conversion takes place. Deposited carbon is removable. During the first stage heating, the rate is kept sufficiently high to prevent large deposition of carbon. From the second passage, on release of the pressure, the vapours are led to a condenser and the tar run off and thus separated. A. L.

251. Process and Apparatus for making Oil Gas. U.S.P. 1,520,804.

This invention, which relates to improvements in methods for producing low boiling hydrocarbons from high boiling hydrocarbons and heating and illuminating gas, has for its primary object the increasing of the production of gas, while producing low boiling hydrocarbons. The process is practically continuous.

Firstly, it is claimed that, by subjecting high boiling hydrocarbons to a temperature sufficient to crack at least a portion of them, separating the lighter vapours from the heavier condensate and condensing them to give light distillate as by-product, and directly subjecting the heavier condensate, without much loss of heat, at atmospheric pressure, to a heat sufficient to decompose it, the major portion of this is converted to fixed gas and a small portion to fuel oil.

Secondly, the above heavier condensate is mixed with aqueous fluid and directly subjected to heat at atmospheric pressure sufficient to decompose it with similar results.

Thirdly, this can be done while permitting the same to expand and subjecting it to a heat sufficient to convert the greater portion to fixed gas.

Fourthly, a method which consists of passing the vapours of high boiling hydrocarbons into a body of hydrocarbon liquid in a holder below its surface, allowing the hot vapours to rise freely through liquid in holder, thus heating it and at the same time condensing high boiling fractions of the vapour, condensing the light vapour from the surface of the liquid in the holder, and, withdrawing the condensed oil from the holder, subjecting it without great loss of heat to heat sufficient, at atmospheric pressure, to convert the greater part to fixed gas.

Fifthly, vaporising high boiling hydrocarbons, condensing lighter portions to give low boiling products, and, condensing the heavier vapours and subjecting them to heat sufficient, at atmospheric pressure, to yield the major portion as fixed gas without substantial loss of heat.

Sixthly, a method which gives large yields of gas and relatively low yields of low boiling liquids.

High boiling hydrocarbons are vaporised and the vapour passed continuously into a holder in which is maintained a cushion of condensate. The light vapours from the holder give the low boiling liquids. The condensate from the holder is passed to a converter where, at atmospheric presure, it is subjected to a heat sufficient to decompose it largely to fixed gas.

A modification of this last is that the vapours of the heavy hydrocarbons are passed through heated zones, and are partly converted to fixed gas before entering the holder.

Again, a holder with a contracted lower end is connected to a converter. The holder is connected to a condenser for light vapours. A second con-

verter, having tubes permitting expansion of material treated, and fitted with a condenser, is also connected to the holder.

Or, the first converter is fitted with inclined tubes through which the material gravitates. A pipe, connected to the lower ends of the tubes, leads to a holder from which condensate flows by gravity to the tubes. A. L.

Geological and Fields.

252. Rôle of Heavy Minerals in the Coalinga Tertiary Formations. R. D. Reed. *Econ. Geol.* **19**, 730. Dec., 1924.

This is a study of the distribution of heavy minerals—*i.e.*, minerals with a specific gravity of more than about 2·9, in the tertiary formations of Coalinga, California, with the object of determining the limits within which heavy minerals may be used for correlation purposes.

The author classifies heavy minerals into three groups—

(1) Unstable under weathering, but abundant as primary constituents—*e.g.*, amphiboles and pyroxenes.

(2) Very stable; widely but sparsely distributed in crystalline rocks—*e.g.*, zircon and titanite.

(3) Stable, but of rare or local primary occurrence—*e.g.*, topaz and andalusite.

Analyses of samples from Coalinga show that the Eocene formations were rich in the second group minerals, while minerals of group 1 predominated in the Miocene and Pliocene.

The probable source of Tertiary material had already been deduced from other observations, which are now confirmed and usefully supplemented by the evidence of the heavy mineral assemblages. The author considers the possibility of determining the climate at the time of deposition, the agencies by means of which the materials were transported, and the conditions within the basin of deposition. He concludes that, so far as heavy minerals are concerned, they must be looked to chiefly for information about the geology of the "distribution province" (region of weathering), and about the currents within the "depositional basin."

In considering whether heavy mineral assemblages can be employed for the purposes of correlation, two important questions arise:—

(1) Are the different beds of a series in a given vertical section distinguishable by means of their heavy mineral assemblages?

(2) If so, are these distinctive characters persistent over large areas?

In theory, one bed in a vertical series would be expected to differ from another, and striking differences were in fact found in the field in the content of both the commoner, ferro-magnesian minerals and the rarer and more stable ones. The assemblages remained much the same whether the containing rock was shale or sandstone.

The lateral persistence of heavy mineral assemblages would be expected to vary greatly with the conditions of deposition. Modern beach sands, for instance, have been shown to be very variable. On the other hand, in large lakes and on the continental shelf, the conditions are favourable to a constant mineral composition over wide areas. In the field, two beds that could be followed unmistakably for long distances were sampled, and the similarity between the heavy mineral contents of the samples was striking. The beds sampled were, of course, themselves exceptionally persistent.

No persistent difference could be found between the heavy minerals of the Miocene and Pliocene of Coalinga, but either could be distinguished at a glance from the Eocene avenal sandstone by its heavy mineral content.

For correlating well-samples, heavy minerals have certain advantages and disadvantages—

(1) Heavy mineral zones are not conspicuous, and their recognition requires special training.

(2) Heavy mineral assemblages may be repeated in different beds. The best results can be obtained only by studying the heavy minerals of all the strata in one well and comparing its zones as a whole with those of other wells.

(3) The zones will not, at best, pass beyond the limits of a single basin of deposition.

On the other hand,

(4) Heavy minerals are very rarely absent.

(5) They are usually well preserved and easily identifiable.

(6) Heavy mineral zones (at least in the Californian Tertiary) seem to be thinner than fossil zones. W. G. W.

253. Geological Notes on a Part of Southern Trinidad, B.W.I. Charles Gordon Carlson. *Econ. Geol.*, **20**, 153, Mar.-Apr., 1925.

Trinidad is related geologically to South America and falls into five geological provinces—

(1) The Northern Range of metamorphic rocks.

(2) The alluvium-swamp deposits south of this.

(3) The Central Range of disturbed cretaceous and lower tertiary rocks.

(4) The Naparima marl belt (upper oligocene and miocene).

(5) The Southern Range, whose core resembles that of the Central Range, but is mostly covered by Miocene beds.

Much of the geological information has to be obtained by pitting and augering.

The Southern Range has an average height of about 125 feet, but rises to over 600 feet in the Moruga area. The topography is sharp with parallel-crested ridges trending N. 70–80° E. In Cedros and the oilfields the relief is less abrupt. Where there are quaternary deposits it is broadly undulating. Burnt carbonaceous shales of "porcellanite" and oil-impregnated sands give rise to prominent features.

Generally, southern Trinidad is covered by Miocene deposits unconformable upon lower tertiary and older beds.

Cretaceous beds outcrop in the Central Range, but nowhere south of it. Fragments of Cretaceous limestones are, however, found in mud-volcano flows.

The Eocene occurs only in one or two small exposures in the Southern Range. Erosion took place during middle Eocene; renewed deposition, under mainly littoral conditions, began during upper Eocene, with a distinctive basal conglomerate. The last period is represented in both Central and Southern Ranges. Some Eocene beds are petroliferous.

Oligocene sediments occur in small areas in the Southern Range, in the Lamont-La Fortune anticline and in mid volcano breccias. Their marly and foraminiferal character suggests uniform deep-water conditions of deposition.

Miocene rocks began to be deposited after a short unconformity, and overlie most of southern Trinidad up to a thickness of 7,000 feet in Cedros. They are littoral, and are divided arbitrarily into Moruga and Naparima formations. The former is the more sandy, but the latter contains the most important oil-sands. The Moruga beds comprise the porcellanites and most of the lignites. The Miocene beds rapidly become finer in passing northwards, the sandy beds feathering out along a line from Barrackpore, passing about a mile north of the Apex field to the coast about two miles east of Brighton.

The quaternary deposits lie unconformably upon the older ones and are best developed in Cedros, where they do not exceed 200 feet in thickness. They seem to have accumulated under semi-arid conditions.

Steeply-cut stream-beds, raised beaches, wave-cut terraces, and old drainage-channel conglomerates indicate that recent uplift has occurred.

Three major structural units occur in the south of the island—

(1) The southern anticline.

(2) The Point Fortin-Forest Reserve uplift.

(3) The intervening syncline.

The southern anticline is a complexly folded and faulted zone, with very steep dips, whose trend except in Cedros is the dominant one of about N. 70° E. Where folding has brought the underlying Naparima clay into view, isoclinal folding with axial planes dipping northwards occurs. There are two sets of faults at right angles. The oilfield district structure is simpler with little faulting and less acute folding. The folding began in the Miocene and continued intensely into the Pliocene, the southern range area being the first affected.

Mud volcanoes are practically restricted to the area of outcrop of Naparima beds, and they have given rise to extensive mud-flow clay breccias, which cover areas along the southern fault zone. It is suggested they are formed by gases emanating chiefly from the Oligocene or older beds. W. G. W.

254. Geology of the Oilfields in Japan.—G. Kobayashi. *Econ. Geol.*, **20**, 67. Jan.–Feb., 1925.

Petroleum and asphalt have long been known in Japan, and were extracted from hand-dug wells in the thirteenth century. The first company was started in 1871, but the industry was not assured until 1891, when the Nippon Oil Company brought in a flowing well in Echigo province. In 1900, a branch of the Standard Oil Company drilled wells in Hokkaido with poor results. A total production of 3,000,000 barrels was reached in 1916 since when it has dropped to about 2,000,000. The introduction of rotary drilling in 1908 led to rapid development of the Echigo and Akita fields.

The principal oil-yielding belt runs from the north of Hokkaido, crosses the Tsugaru Strait, and continues down the west coast of Hondo as far as Nagano, where it disappears, to come up again in Totomi Province on the Pacific Coast.

Petroleum is found in Tertiary formations only. The Hokkaido formations are divided by the "Central Zone of Depression," and range from Eocene to Pliocene (with unconformability between each series). They consist of coal measures, black marine shales, marine sandstones, and grey shales with tuffs. The formations have been strongly folded with a north-north-east to north-east strike and much contemporaneous activity. Signs of oil occur throughout, but no important collections have been found. Details are given of the principal anticlines. The production from Hokkaido does not exceed 7000 barrels a year.

The Akita fields are 128 kilometres long, parallel to the coast. The oil occurs in a series of tuffs and shales, of Miocene age, in the lower part of which only it is in commercial quantity. The general strike is north-north-east, and the folding is gentle. This region contains the Kurokawa field, famous for a gusher which produced 10,000 barrels a day.

The Echigo fields are Miocene and Pliocene in age, and the rocks consist of black shales, tuffs and sandstones. They are marine and littoral deposits. The general strike is parallel to the coast—*i.e.*, north-north-east, and most of the fields are on elongated domes.

Generally, the oil occurs at many horizons associated with salt water. Its density varies from 10° to 50° Bé. It belongs to the naphthene series with a little paraffin, and is thought to have originated in the black or dark grey shales. In some places it has been affected by volcanic action.

W. G. W.

255. Über die Aufgabe der Geologie im Bohrbetriebe auf Erdöl. [On the Use of Geology in Petroleum Boring Operations.]—Dr. Karl Friedl, Vienna. *Petr. Zeitschrift.*, xxi., 3. Pp. 142–146.

This deals with the aid geology is lending to actual boring research work. The author classifies his subject under various heads :—

(1) The knowledge of the right time to shut off water.

(2) When to suspend further drilling for oil when encountered. These two cases are considered of a dry and water-bearing oil-sand.

(3) The recognition and avoidance of "critical" horizons ; that is, those which for some reason are dangerous for the bore-pole.

(4) The correct application of torpedo work.

(5) The right time to suspend drill-work, when it becomes hopeless to expect further results in depth.

(6) The discovery of curvature in the bore-hole.

Each of these cases is considered by the author, his illustrations being chiefly drawn from the Boryslaw field. He states that in the Polish, and many other oilfields, fantastic sums are yearly lavished which the application of geology would have saved. J. E. M. H.

256. Die Argentinische Erdölindustrie. [The Petroleum Industry of the Argentine.] Dr. Joh. Rosette, Hamburg. *Petr. Zeitschrift.*, xxi., 3, 4, 6, 7.

The author, in four papers, describes the origin, development, and relation of this industry to the international petroleum economy and policy. He states that at present there are four zones of practical importance :—

(*a*) The Andes district and Cachenta, at the south end of the Mendoza pre-Cordillera. (*b*) The southern part of Mendoza Province and the Neuquen territory. (*c*) The Sub-Andean zone, from Bolivia to the provinces of Satta and Jujny. (*d*) On the Patagonia Coastal district, Comodoro Rivadavia on the Gulf of St. George.

The comparative simplicity of the Patagonian field is contrasted with the complexity of the Satta and Jujny provinces, and the Andean zones. A sketch map is given (4, p. 207) of the Argentine oil-zones. This character of the oils from the various districts is described, and statistics of production from 1907 to 1923, rising from 1000 barrels in 1907 to about 3,000,000 in 1923. A comparison is instituted between the Argentine oil-industry and that of other lands. The application of the oil, dependent industries, prices, the organisation and financing of the industry are dealt with. State—or private—operations are discussed, and finally under Section III. the relation to the production and oil policy of other nations is dealt with. In the last paper an interesting account is given of the various large Companies that are interested in this field, such as the Anglo-Persian Oil Co., the Royal Dutch-Shell, the Eastern Petroleum Co. (allied to the Burmah Oil Co.), etc., etc. A short bibliography is appended, giving the papers and journals referring to the Argentine industry. These articles represent the most up-to-date and thorough review of the whole subject of oil in that country.

J. E. M. H.

257. Is the Shale-Oil Era Here!—Victor C. Alderson. *Petr. Age.*, Feb., 1925.

The progress in oil-shale matters during 1924 is reviewed, through the medium of some prominent features.

(1) The work of Mr. M. S. Trumble in California in producing water-white gasoline in one operation.

(2) The success of Mr. R. M. Catlin in developing an oil-shale plant on a commercial scale, and marketing the products.

(3) The active interest of the U.S.A. Government.

(4) The industrial importance of producing oil from shale at a cost less than that of imported oil in countries such as France, Spain, England, Estonia, Sweden, Australia, Tasmania, Brazil, and Japan.

(5) The need in the U.S.A. of an increased daily oil production of 400,000 barrels in order to keep pace with the increased demand, coupled with an absence of any relief except through the use of oil-shale.

(6) The fact, generally admitted, that there is more fuel, calculated in heating value, in the known oil-shale deposits of the world than in all the coal, lignite, peat, and well-oil deposits combined. J. E. M. H.

258. Petroleum in Alaska, 1924.—*The Petr. World.*, XXII. 293. Feb., 1925, p. 84.

The Standard Oil Co. of California has drilled to a depth of 3017 feet on the Pearl Creek dome, Cold Bay district, and the Associated Oil Co. went to 2170 feet. Both wells show signs of oil. W. R. Smith, of the Geological Survey, made topographic and structural maps of the Bear Creek-Salmon Creek anticline, and obtained data on the structure at Wide Bay, and the probable source of oil in this district.

Geologic and topographic surveys were made in Northern Alaska under the direction of Philip S. Smith, three parties carrying on field work in the Naval Petroleum Reserve No. 4, and in adjacent regions. By these surveys nearly 20,000 sq. miles were mapped, and a large amount of information gained about a region hitherto practically unknown. The work confirms the finding of the expedition that visited the coastal portion of the reserve in 1923, and reported the occurrence of seeps of oil there. Further study of the survey results is necessary before a statement is warranted regarding the possibility of obtaining oil in the region. J. E. M. H.

259. "Paraffin Dirt." Its Nature, Origin, Mode of Occurrence and Significance as an Indication of Petroleum.—H. B. Milner. *The Mining Mag.*, Feb., 1925. Pp. 73–85.

The name "paraffin dirt" is applied to a type of soil occurring in the Gulf Coast regions of Texas and Louisiana, U.S.A. Its value as a surface indication of petroleum has been much debated by geologists and oilfield engineers, and the subject is exhaustively treated in this paper.

Similar material (alleged) has been observed in Colombia, Cuba, Roumania and Burma, and this article contains the record of the learned author's researches. The laboratory work included the microscopical examination of samples, both in thin sections, and by reflected light. The organic matter present was also examined microscopically, and physical tests were applied, and a full chemical analysis was made by Mr. A. Wolf.

Nature of "Paraffin dirt."—It is an uncommon facies of argillaceous soil. It is not a mineral deposit, nor the weathered remains of subjacent rocks. It has no resemblance to ozokerite or other solid hydrocarbon found in nature, and is quite unlike any form of bitumen found in petroliferous regions.

Its "rubbery" or "curdy" texture is its most peculiar physical property. Exposed to heat it loses its resiliency and becomes a hard "sun-baked" soil. The rubbery texture is related to the amount of moisture—hence its occurrence in marshy or swampy ground of the Gulf Coastal Plain.

Its normal colour is grey-brown or yellow-brown tinged with red (limonite) where oxidised. It has no characteristic smell, certainly not recalling that of paraffin or other well-known petroleum product.

It usually occurs in low moist areas, though it has been discovered on high ground also (Pratt) free from inundation. These low-lying areas are mainly situated within the belt bordering the Gulf Coast and reaching some twenty

miles inland. The track passes often into prairie-land clothed with numerous grasses, and often interrupted by forests of pine, oak, cypress, etc., associated with thick undergrowth and vigorous climbing plants. This Physiography and vegetation bear upon the facilities of accumulation of vegetable organic matter, which tends to be rapid and widespread.

Apparently the most favourable locality for the formation of "paraffin dirt" is a damp seepy spot round which vegetation flourishes, though the spot need not be marshy. It is thus one of the distinctive products of a distinctive environment. The depth varies from 2 to 7 or more feet.

Petrological Analysis.—Samples may be classed as clays essentially composed of particles averaging 0·01 mm. and less in diameter.

There is generally much fine sand present.

The microscopical investigation described shows that "paraffin dirt" is a true soil. It is not so homogeneous as many clay soils. Its peculiar properties are therefore assumed to have been developed subsequent to its formation as an ordinary soil, and are not inherent to the substance as first accumulated.

"Paraffin dirt" is just as much a colloidal system as any other form of soil—though accumulated under a moist environment it cannot be classed as a true peat soil, though closely allied to this type.

The organic content of the dirt is high, and it has a strong adsorptive capacity, which renders this soil peculiarly sensitive to the impress of properties acquired as a result of external influence, such as fluid impregnation.

The Chemical Analysis (Mr. A. Wolf).—This is described fully. The conclusions are—(1) That the soil is free from paraffin and asphaltic hydrocarbons, and only contains the constituents normal to most soils. (2) The soil is abnormal in its high content of organic matter, and possessing a certain elasticity. There is no scientific support for the soil being connected with the presence of petroleum. (3) No chemical compounds are in the soil such as would be associated with, or give rise to, or to result from the chemical decomposition or oxidation of crude petroleum.

Results and Conclusions.—The following points have been clearly demonstrated :—

(1) "Paraffin dirt" is not a definite chemical compound.
(2) It is not paraffinaceous.
(3) It is an argillaceous soil, with abnormal amount of organic matter.
(4) The term "dirt" is a misnomer—unless as applied colloquially to all clay soils.
(5) It is not a residual product of inspissated petroleum, and cannot be classed with the solid bituminous indications of that fluid.

Various conflicting opinions are then cited as regards the origin of the resilient texture of the substance, and its significance, if any, as an indication of concealed oil pools. The author points out that it is unnecessary to invoke the presence of ascending petroleum gas from depth where there is such abundant evidence of gas generation within the soil environment ($CH_4.CO_2.H_2S$ from organic decomposition *in situ*). The author concludes by stating that he does not regard "paraffin dirt" as a reliable index of soil.

J. E. M. H.

260. Oil Geologists' Use of the Aeroplane. Dr. Stanislaw Zuber (Lemberg). *Petr. World.* April, 1925.

This well-known authority on the geology of the Baku oilfields of Russia made a number of journeys by hydroplane over that district, notably a strip of the coast of the Caspian Sea, and has published a pamphlet (printed in Polish) on "The Use of the Aeroplane in Geological Investigations at the Caspian Sea."

It was found possible—

(1) To observe submarine and volcanoes belonging to the system of the Baku Archipelago, mud volcanoes forming islets of the latter, and those grouped on the shores of this part of the Caspian.

(2) To observe various geological phenomena on land, as also on the bed of the sea.

(3) To make hydrographical investigations.

(4) To make climatological observations.

Two very interesting photographs accompany the summary of Dr. Zuber's work, and it is noted that three others were published in *Oil News* of March 28. J. E. M. H.

261. (*a*) The Russian Petroleum Industry; Mar. 7, 1925. (*b*) Petroleum Prospecting in Russia; Mar. 14, 1925. *Petr. Times* xiii., 322-323.

(*a*) The Russian petroleum industry is "consolidated as a State industry" under three heads: the Baku district, the Grosny fields, and the Emba fields, each with its own organisation, which controls the drilling and operations and the refining of crude oil.

The Baku refineries dealt with about 150,000,000 poods in 1923-24, producing lighting and lubricating oils largely, with rather less motor benzine. Cracking plants are said to be in preparation at these refineries to produce motor spirit for export.

It is claimed that the Russian benzine is superior to American spirit, since it contains a large proportion of light aromatic compounds, making it possible to use this spirit at higher compression in motor engines.

(*b*) The Soviet Government is credited with the hope of placing Russia once more at the head of the petroleum-producing countries of the world. It is alive to the importance of fully developing the petroleum resources of the country, seeing in this a certain source of large revenue.

The "Asneft" (Baku organisation) is conducting exploration in fields adjacent to those of the Aspheron Peninsula, some also at Kabristan and elsewhere.

Amongst other areas explored are—

(1) Part of the Bibi-Eibat inlet; 56 borings test the Illjitach field, four are flowing wells, four are productive, whilst drilling is still continuing on the others.

(2) Sixty wells are to be drilled in Charassany, between the mud volcanoes of Ku-Maku and Bog-Boga.

(3) In the Kalnischen district three drillings are in progress; and

(4) In Schubany five drillings have been started.

(5) Exploration is also proceeding along the new railway from Mount Kir-Maku and Binajady. Whilst

(6) Several drillings have been started near the Pata station (Transcaucasian Railway).

The Russian geologist, Professor D. Golubjatnikoff, declares that the geological indications for petroleum in the area forming the immediate continuation of the old Bibi-Eibat field are equally favourable. He estimates the total reserves of this old field (comprising 800 acres) to be 4032 million poods, that for the Illjitach field (400 acres) 3000 million poods, together some 113 million English tons. J. E. M. H.

262. Test Wells Recommended for Australia. Dr. Arthur Wade. *Petr. World* xii., 295, April, 1925.

This is the first instalment of Dr. Wade's Report to the Government of the Commonwealth of Australia on the prospects of petroleum production

in (1) the Kimberley district of Western Australia; (2) the Northern Territory.

[The sole spot recommended for drilling test wells is at Price's Creek.]

Areas on the Fitzroy River.—A series of wrinkles in the rocks underlying the plains can be traced for some 200 miles, then run W.N.W., E.S.E. parallel to the river course from Derby to Christmas Creek, and then turn S.S.E. parallel to the Creek. The axis of these folds he terms the "Grant Range Anticline." A second runs through the "Mt. Wynne area," and a third is in the "Poole Range" (axis N.N.W., to S.S.E.), and finally the fourth runs through the Rough Range and Price's Creek. These are separately described.

General Structure of Fitzroy Area.—A broad zone of metamorphic (pre-Cambrian) rocks sweeps around from the borderline between Western Australia and the Northern Territory N.E. of Argyle Station and on the sixteenth parallel of latitude as far south as Christmas Creek, on the twentieth parallel, and then back to the sixteenth parallel at Jumpi Sound, where the sea cuts it off. On the outer margin of the circle rest unconformably, a series of less altered sediments, which pass up into the fossiliferous "Lower Cambrian" series in the basin of the Ord River. They consist of quartzites, quartzitic geste, conglomerates, and sandstones, fine grained siliceous shales and flags. South of the Fitzroy area Carboniferous and Permian rocks appear to form a huge basin as far as the twenty-third parallel of latitude, extending from the coast south of Broome nearly across Western Australia. Sagging and folding of these rocks occur along their northern margin, which is due to the resistance of the pre-Cambrian shield to the north, the folds becoming narrow and more pronounced as this metamorphic area is approached.

Inside the metamorphic belt the same rocks reappear, but vary greatly in behaviour, some lying horizontally, others dipping at high angles. Little is known of this area.

Dr. Wade then proceeds to give the conditions for the accumulation of oil in commercial quantities, and incidentally defines the proper use of the term "oil pool." The liquid, he says, is held in porous strata just as a brick will hold water. Hydrostatic pressure is exerted on the accumulated oil, partly from the gas it gives off, and partly by a closed structure of folding or faulting that traps it. On drilling into such a structure relief is given, and if the gas is accompanied by oil, the "gusher" results. Or oil may flow or rise in the bore casing.

(*To be continued.*)

J. E. M. H.

263. Increasing Production of Petroleum by Increasing Diameter of Wells. Lester C. Uren. *Nat. Petr. News.*, XVII., No. 5, 99–106. Feb. 4, 1925.

The principal moving force of oil is the pressure of natural gas dissolved or occluded within the oil. Wells provide centres of reduced pressure and oil flows into them by the difference in pressure in the space and the reservoir rock. By increasing the diameter of the well from say 6 inches to 20 feet would at least double the productivity of the well and at the same time increase the drainage area, the advantages of early exhaustion being obvious. In addition operating expenses would be reduced.

The process described, which has as yet only been tried on a laboratory scale, consists of eroding the oil-sand, by means of a high-pressure jet of oil directed from tubing lowered into the well. A cavity 20 feet or more in diameter is thus made and is subsequently filled with gravel to support the walls and prevent caving. The well is kept full of oil during the operation

and the oil circulates in a similar manner to mud-laden fluid in rotary drilling. By adjusting the velocity of the returning oil, sand, clay, etc., are carried to the surface, the interstices of the deposited gravel thus being kept clear. G. S.

264. Successful Method of Melting Paraffin in Wells Found by Hope Company. Lawrence E. Smith. *Nat. Petr. News.*, XVII., 4, 55–60. 1925.

The technologists of the Hope Natural Gas Company have developed a process for the removal of paraffin from oil wells, which consists of means by which a flame is maintained at the bottom of a well, reducing the paraffin, which tends to clog the pores of the oil-sand, to a liquid which can be easily removed. Temperatures of 2300° to 2700° are maintained.

Surface equipment consists of two compressors, one for gas and one for air, and a small amount of the gas and air mixture is burnt in a pilot light between the mixing cylinder and the entrance to the well. Valves are provided to cut off the fuel, and pressure gauges are also fitted. A hand-operated mandrel line is used for lowering the fuse.

Fuel is fed into the well through 2-inch tubing, to the lower end of which the burner tip is attached. A metal screen basket is fitted below the burner as a safeguard against back-firing.

When treating a well, the tubing is pulled and the well bailed and cleaned. The burner is lowered to the required depth and the fusee run in on the mandrel line. Gas and air pressures are kept at 15 lbs. and 50–75 lbs. respectively, and the heat treatment continued for about four hours.

Several cases in which this method has been used are quoted and an increased production is recorded in each instance. G. S.

265. Control of Gas Pressure Great Factor in Conservation of Oil. By S. F. Shaw. *Nat. Petr. News.* Dec. 3, 1924.

The article deals in a general way with the factors governing the flow of oil to a producing well, and the efficiencies of the various methods of production.

The use of the "bean" as a means of conserving gas is not considered to be good practice, and is compared to some extent with the more efficient method of constructing suitably proportioned "flow lines."

A formula is given for calculating the amount of gas required to raise a quantity of oil to a certain height, together with a table of results obtained for various pressures and heights of lift.

In conclusion the following points are stressed :—

(1) Accurately designed flow lines should be installed in order to conserve gas pressure.

(2) Compressed air equipment should be used when the well ceases to flow.

(3) Efficient plunger pump equipment should be installed when production becomes very much reduced. W. H. T.

266. Improvements in or Relating to Deep-Boring. E.P., 227,712.

An improved method is described for guiding or deviating a bore hole, and imparting a predetermined direction to it. A guiding piece, the upper portion of which is crescent shaped in cross section, and sloping away downwards to the required angle, is fixed in the hole with suitable cement grouting. The guiding surface is adapted to guide the boring tool, and to prevent any deviation of the latter in a lateral direction. W. H. T.

Coal and Shale.

267. The Sulphur Compounds of Kimmeridge Shale Oil. I. F. Challenger, J. R. A. Jinks and S. Haslam. *J.C.S.*, 1925, **127**, 162–166.

The odour of the crude oil obtained on distillation of Kimmeridge shale suggests the presence of pyridine bases and unsaturated hydrocarbons. The oil itself is characterised by its high content which is from 5–8 per cent. of the crude oil. The authors have examined the portion of the oil volatile in steam and find that after the bases, phenols and traces of ketones have been removed, the residual oil gives a fraction boiling at 80°–100° C. on distillation under diminished pressure. From this 2-methyl-thiophen has been isolated and identified by means of its mercurichloride and mercuribromide. A pure specimen of the substance regenerated from these derivatives reacted with bromine to give tribrom-2-methyl-thiophen, melting at 86°–87° C., thus definitely determining the constitution of the substance. Toluene was also identified in the same fraction. Further fractions of the original oil were found to contain thiophen which was characterised by means of its mercurichloride, which depressed the melting point of the corresponding 2-methyl-thiophen derivative. The highest fractions of the oil were semi-solid and gave a sulphur-free wax on treatment with alcohol and ether.

S. F. B.

268. Mineral Wax from Oil-Bearing Shale. D. T. Day. U.S.P., 1,513,745.

The shale is extracted by a boiling solvent, such as ethyl alcohol, from which the paraffin-like substance separates on cooling. After removal of the hot solution and separation of the wax by cooling, the solvent is ready for extracting fresh shale.

S. F. B.

269. Multiple-Retort Ore and Oil-Shale Roasting Furnace. A. M. Beam, Assr. to The American Continuous Retort Co. U.S.P., 1,523,682. Jan. 20, 1925. (Appl., Feb. 17, 1920.)

A combined ore and oil-shale roasting furnace contains two sets of continuous retorts, one adapted to give steam treatment to oil-shale and the other adapted to give to ore containing precious metals a treatment to remove carbon, sulphur, antimony, arsenic and other volatile elements. Automatic devices are provided for feeding the oil shale or ore through the retorts.

T. A. S.

270. Apparatus for Extracting Petroleum from Shale and other Minerals. G. A. Taff. U.S.P., 1,522,985. Jan. 13, 1925. (Appl., Feb. 14, 1921.)

A heated horizontal retort is fitted with a conveyor band which conveys material from a feeding hopper along the upper portion of the retort and back along the bottom portion of the retort to a discharge member. The retort is fitted with a vapour off-take.

T. A. S.

271. Fuel Obtained by Extraction of Shale. D. T. Day. U.S.P., 1,513,746.

Mineral products containing paraffin wax and resin, such as shale, are extracted by hot alcohol to produce a fuel which is in the form of a solid emulsion.

S. F. B.

272. BITUMEN, TAR AND OTHER SUBSTANCES, IMPROVED APPARATUS FOR HEATING. Thomas Coleman and Sons, Ltd., and Frank Coleman. E.P. 227,168.

The floor of the heating chamber is arched over a furnace and the liquid space is divided longitudinally into three chambers. The three chambers intercommunicate through spaces below the dividing strips, and these spaces can be varied by raising or lowering the strips. Draw-off cocks are provided at the lower edges of the two outer chambers. G. S.

273. TAR, A PORTABLE OVEN FOR HEATING IN CASKS. Joseph Young and John Russell Forrester. E.P. 227,684.

Describes a wheeled vehicle on which a box-like oven having doors at each end is mounted. Longitudinal rails are provided for the casks, and the furnace is separated from the oven by a layer of fire-bricks, thus preventing damage to the casks. A drip pan is provided in the oven to catch any drips from the casks. G. S.

274. IMPROVEMENTS IN OR RELATING TO THE GASIFICATION AND DISTILLATION OF CARBONACEOUS MATERIALS. E.P. 227,880.

This invention relates to methods of treating carbonaceous or other materials of this nature, in which the material to be treated is caused to enter in powdered or pulverised form at one end of a rotary furnace or retort, and to be carried forward into contact with hot gases generated by combustion of carbonaceous fuel and air at the opposite end.

The fuel, powdered, is introduced under sufficient pressure or speed, high enough to keep the solid particles in suspension. Air for primary or secondary combustion, together with steam if desired, is introduced separately to the interior of the retort at different points along its length. Air may also be introduced with the powdered fuel, and steam introduced at points along the retort. This air and steam is drawn along passages placed along the length of the retort to be preheated. Steam may be generated by passing the hot gases from the retort through a boiler. Transversely disposed baffles may be fitted to cause the material to be picked up and exposed better to the action of the hot gases.

For production of illuminating gas, two retorting chambers, which may be superimposed to one another, are utilised. Powdered fuel is subjected in the first chamber to primary distillation by using the sensible heat of water gas, and the solid residuum from this section is then introduced into the second chamber and treated as described above. The hot residuum may be first powdered. The water gas may be passed through chequer-work compartments located in the retort and heated.

Ores may be reduced in similar apparatus. A. L.

275. VALVES FOR CONTROLLING, REVERSING, AND BY-PASSING THE FLOW OF GAS THROUGH PURIFIERS, CONDENSERS AND THE LIKE, IMPROVEMENTS IN. Robert Dempster and Sons, Ltd., James Edward Horsfall and Herbert Lumb. E.P. 227,213.

An improvement on patent No. 211,269 in that the various directions of flow are produced with less valves, consists of a rotary plug valve in the form of a hollow drum open at one end and having an opening in its periphery. The casing of this drum is provided with three openings in the purifier, bottom, top, and intermediate, and the open end of the drum coincides with an opening in the front wall of the purifier, from which a branch pipe connects to the regulating valve. G. S.

276. Gas Producers, Improvements in and Relating to. George Herbert Bentley and Edmund Gardner Appleby. E.P. 227,346.

Relates to gas producers having a main gas generating chamber combined with a distillation chamber, with agitators in each. The agitator in the generating chamber is a short distance, say 1½ inch, below the distillation chamber, and maintains the fuel at an even level in the generating chamber. The agitators in the distillation chamber are attached to the same vertical shaft as the agitator in the generating chamber, and a bell is also fitted. The distillation chamber is half the diameter of the generating chamber. Fuel is admitted to the distillation chamber through a rotating valve, the speed of which varies with the speed of the agitators. The outlet for the distilled gases is at the top of the chamber, and may be connected either to the generating chamber or to a condenser. G. S.

277. Gasification of Fuel and the Production of High Grade Gas, Improvements in and Relating to. Jens Rude. E.P. 227,726.

Solid fuel is completely gasified by first passing through an internally-heated retort and then through a water-gas producer. The chief source of heat for the retort is the latent heat of the gas produced during the blow period of the producer. The present patent, which is an improvement on No. 218,925, deals with obtaining a continuous flow of the heating fluid through the retort independent of the intermittent action of the producer. Two regenerators are used as heat exchangers, the blow gases and water-gas circulating through one, while the other, with its accumulated heat, serves as a heater for the heating gas before admission to the retort. G. S.

278. Improvements Relating to the Distillation of Carbonaceous Substances. E.P. 227,879.

In this improvement, vertical retorts are utilised, either in single units or in benches. Steam is admitted to a heating compartment arranged in the setting beside the retort, and is here heated to temperatures of 750°–1200° C. It passes downward through a combustion chamber and then through an accumulation of carbonaceous material. A combustible gas is thus formed, part of which passes through and heats the material in the retort, the other portion passing into a second combustion chamber where it is burned. The hot gases raise the temperature of a second heater. As soon as the first heater cools down the process is reversed.

Depending upon the products desired, the temperature and quantity of the steam used may be varied. Also by this means coal reduced to great fineness and compressed to blocks may be distilled. A. L.

279. Improvements Relating to Installations for Carbonising Coal or Other Fuel. E.P. 224,179.

This invention relates to a combination which improves the methods of retorting of coal, etc.

A waste heat boiler is run under induced draught, brought about by a steam turbine, preferably, as the engine. The induced draught also operates upon the heating flues of the installation. The engine is adapted to discharge steam at comparatively low pressure. This steam discharged may be led through a separator on its way to the retort, or through a superheater installed in the inlet products chamber of the waste-heat boiler, or the flues leading to it, or through a superheater independently gas-fired. A. L.

280. Washing the Fine Categories or Dust of Coal, Methods of and Apparatus for. Jean Knapen. E.P. 211,148.

The slime massing at the bottom of the channels leading from coal washers is caused to fall into one or more boxes, partly raised above the level of the channel, and always kept filled with water. The fall of the mass creates bubbles and eddies which cause light particles of coal to flow back into the channel, whence they are carried to a collecting pit. A mud of schists collects at the bottom of the box and is discharged therefrom. G. S.

281. Coke-oven Installations, Improvements Relating to. Wilhelm Bunge. E.P. 220,308. Conv. (Germany), Aug. 6, 1923.

Explosions in mains carrying gases to coke-ovens or to boilers are caused by air entering through the burners into the mains when the exhauster stops. To obviate this crude gas is introduced in place of the heating gas when the latter is stopped. A small gas-holder connects with the heating-gas pipe, and a bell in the holder is coupled to the lever operating the valve. When the exhauster fails the bell in the holder sinks and operates a valve, giving the crude gas free access to the heating-gas pipe. G. S.

282. Coal, Improvements in or Relating to the Treatment of. Shelton Iron, Steel and Coal Co., Ltd., and Charles Bruce Gardner. E.P. 227,528.

Coal to be washed is first passed over screens through which a current of air is forced or sucked at a suitable velocity to remove dust and fine coal. The fine coal so removed can be afterwards added to the washed coal in its dry state. G. S.

283. Improved Process for Destructive Distillation and Apparatus for Use therewith. E.P. 216,402.

This invention relates to a process for destructive distillation of solid fuels, by which a current of gas passes up through the material in a vertical chamber, heating it, and causing distillation.

The gas is separately prepared and preheated to a predetermined temperature. Suitable means are provided for delivering the coke or residue. An inert gas, such as nitrogen, with part of the products of distillation may be employed. Means are provided for the admission of a cold fluid, such as water, to the entering heated gas, whereby its temperature is controlled. The process is continuous, and retorts of large diameter may be employed. A. L.

284. Peat, Process for Draining and Pressing. Karl Mans. E.P. 227,673.

The pressed blocks obtained from the process described in patent No. 182,503 are broken up and mixed, if desired, with a suitable proportion of coarse-grained dry peat and then subjected to a second pressing. G. S.

Abstracts.

Arranged by W. H. Thomas, A.R.S.M.

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General.

285. Tests Show Cutting of Crude Loss Possible by Using Proper Tank Paint. *Nat. Petr. News*, April 8, 1925, p. 36.

The Bureau of Mines has recently issued Serial No. 2677, Reports of Investigations, compiled by Ludwig Schmidt. This report deals with the colour of storage tanks and its effect upon evaporation losses.

The most important test described consisted in filling four tanks, each of 55,000 bbl. capacity, with fresh crude oil and making comparative tests over a period of 12 months. The tanks were painted black, red, battleship grey and aluminium, and all were kept as vapour-tight as possible, leaks being caulked regularly.

The evaporation losses over the period of one year were found to be as follows :—

	%
Black tank	1·24
Red tank	1·14
Grey tank	0·99
Aluminium tank	0·83

The report points out that the principal factor which governs evaporation losses is breathing, which in turn is dependent upon the rise and fall of temperature in the tank. Laboratory experiments were therefore carried out to determine the rise in temperature of benzine contained in small tanks painted in various colours, when subjected to rays of carbon arc for 15 minutes. The following results were obtained :—

Colour.	Rise in temp.
Tin plate	19·8° F.
Aluminium paint	20·5° F.
White paint	22·5° F.
Light cream paint	23·0° F.
Light pink paint	23·7° F.
Light blue paint	24·3° F.
Light grey paint	26·3° F.
Light green paint	26·6° F.
Red oxide iron paint	29·7° F.
Dark Prussian blue paint	36·1° F.
Dark chrome green paint	39·9° F.
Black paint	54·0° F.

Small tanks filled two-thirds full with naphtha and exposed to the sun for two hours, placed the colours in the same order of efficiency as regards prevention of evaporation losses. C. V. H.

286. Disintegration of Portland Cement in Sulphate Waters. T. Thorvaldson, R. H. Harris, and D. Wolochow. *Ind. Eng. Chem.*, 1925, **17**, 467.

The disintegration of portland cement concrete through the action of sulphates has been known for years and there are on record some striking examples of failures of concrete structure exposed to sea water. Although in many cases this has been due to faulty materials and workmanship, it is known that concrete made from highest quality cement will disintegrate in time under the influence of high concentration.

By a series of careful experiments the authors have shown that repeated extraction with water will remove the lime component from indurated cement and this extraction is accelerated by the presence of sulphates of sodium or magnesia.

Hydrolysis of the calcium silicates and aluminates takes place under these conditions with the formation of soluble lime compounds.

In addition to this leaching, active crystallisation may also take place with consequent internal expansion and disintegration.

The experiments show the importance and necessity of making a concrete impermeable even when in contact with only fresh water. S. B.

287. Corrosion Problems in Oil Refining.—R. E. Wilson and W. H. Bahlke. *Ind. Eng. Chem.*, 1925, **17**, 355.

The corrosion of petroleum refining equipment, with its attendant losses, constitutes one of the chief problems of the designer and operator of such plant.

Apart from the corrosive action of refining agents which is generally well known and provided for, crude oil and its distillates by nature of their constituents cause rapid destruction of metal in contact.

The presence of magnesium chloride will lead to the formation of hydrochloric acid and similarly the sulphur compounds on decomposition from sulphurous and other corroding acids.

Two methods of prevention are available in the use of chemical neutralisation and corrosion resisting equipment, the former involving a continuous cost and the latter a large capital outlay.

The authors have tested most of the commercial metals for their resistance to the above types of corrosion and find that while high chromium steels showed a marked resistance, wrought iron and steel are very poor; brasses, calorised iron and cast iron occupying an intermediate position. Under conditions of high temperature such as exist in coking stills and pressure stills another form of corrosion is caused by the action of hydrogen sulphide. Under these conditions chromium steels, aluminium and calorised iron stand up well, whereas the copper alloys are almost useless.

Some experiments on the rates of corrosion by hydrogen sulphide at high temperatures showed that the initial rate was very rapid and then slowed down with a protective coating of sulphide. Heating and cooling between runs loosens this coating, however, and the rate of corrosion again rises, increasing with rise of temperature. S. B.

288. The Acid Corrosion of Metals. Effect of Oxygen and Velocity. W. G. Whitman and R. P. Russell. *Ind. Eng. Chem.*, 1925, **17**, 348.

The authors have studied the effect of dissolved oxygen in the corrosion of steel, aluminium, lead, copper, nickel, tin and several alloys by sulphuric nitric, hydrochloric and acetic acids.

It was found that the presence of oxygen usually increased the corrosion of metals by these acids.

Under conditions of passivity and film formation induced by oxidising conditions dissolved oxygen may actually reduce the rate of corrosion, but the corrosion of copper is dependent on the presence of oxygen and is proportional to the amount present.

The corrosion of steel in 80 to 100 per cent. sulphuric acid is slight providing there is no agitation, but corrosion is markedly increased by increasing the velocity due to the removal or prevention of formation of a protective film on the metal surface. S. B.

289. Fertiliser and Insecticide, An Improved. C. Illingworth and H. H. Duckworth. E.P. 230,148.

Is composed of wood ash (burnt wood) 49·0 per cent., soot (old) 22·5 per cent., lime (slacked) 9·5 per cent., sulphur (flowers) 4·5 per cent., and oil (Diesel) 14·5 per cent. The solid ingredients are ground and mixed and the oil then added. G. S.

290. Treatment of Oil Emulsions. W. O. Eddy. U.S.P. 1,529,349 of March 10, 1925 (Appl., May 7, 1923).

An agent, which changes the interfacial tension of the constituents, is added to an emulsion. The emulsion is then subjected to the action of an electrical field which causes the coalescence of the particles. T. A. S.

291. Production of Lamp Black. G. Egloff, assr. to Universal Oil Products Co. U.S.P. 1,535,214 of April 28, 1925 (Appl. June 27, 1921).

Residual oil from cracking plant is discharged into a still and whilst above its flash point air is injected to cause a partial combustion. T. A. S.

292. Improved Process for the Production of Liquid Fuel Suitable for Internal-combustion Engines. The Distillers Co. and H. B. Hutchinson. E.P. 232,276 of Oct. 17, 1923.

Equal volumes of 95 per cent. alcohol and commercial hydrocarbons such as low grade petrol are placed in a still fitted with a fractionating column and analyser. On raising the temperature vapours pass through the column to the analyser which is maintained at 58—65° and effects a partial separation. Condensate from the analyser is returned to the fractionating column whilst the vapours are passed through a condenser to a tank fitted with gauge glasses. The condensate separates into two layers, the lower, being aqueous alcohol which is run off and after dilution to remove petrol is again brought up to 95 per cent. spirit.

The first small fraction up to 5 per cent. coming over from the still does not require any separation, but the fraction coming over above 60° is an azeotropic mixture of hydrocarbon, alcohol and water, and is passed to the separating vessel. When the distillate shows no further separation on cooling distillation is stopped. The hydrocarbon portion from the separator and the residue in the still are bulked and form a non-separating alcohol-petrol fuel. T. A. S.

293. Process of Treating Light Hydrocarbons Used as Motor Spirit and for Extracting and other Purposes, to Prevent Loss by Evaporation. E.P. 230,311 of May, 1924. Sidney Elliot Page (communicated by Jean Henry Brégeat).

Gasoline, ligroin, petroleum ether and such like light hydrocarbons, which tend to evaporate in storage, may be stabilised by the addition of 2 to 4 per cent. of easily combustible hydrogenated compounds of the aromatic series, which boil above 150° C., such as hexahydronaphthalene, decahydronaphthalene, or hexahydrophenol. In this way loss by evaporation may be much decreased. C. V. H.

294. Improvements in or Relating to Fuels for Internal-combustion Engines. Edward Terry. E.P. 230,354 of Aug., 1924.

The new fuel consists of a light hydrocarbon, such as benzole, gasolene, kerosene, paraffin, naphtha or the like, mixed with 25 per cent. to 50 per cent. of acetone. It is said that this gives better effect in high speed engines, lessens carbonisation and heating of cylinder, prevents burning of lubricant, and increases mileage per gallon. C. V. H.

295. Improvements in the Production of Combustible Gas and in Apparatus therefor. Athol Gibson. E.P. 216,833 of 1923.

Combustible gas is produced by carburetting air. The apparatus consists of two chambers, one containing a spirit such as petrol and the other containing water. An engine or pump draws in air through a valve and leads it down a pipe to the bottom of the petrol chamber so that it bubbles through the liquid and collects in the space above. From here it is withdrawn and bubbled in a similar manner through water in the second chamber. It is claimed that in passing upwards through the water the gas undergoes a further change and becomes highly combustible. It may be passed directly to the engine cylinder or stored in a gas holder for any given time without deterioration or change. C. V. H.

296. Improvements in Fuels for Explosion Motors of All Kinds. Joseph de Cosmo. E.P. 205,070 of Sept. 27, 1923.

A fuel is made by mixing refined mineral oil (benzine) with raw naphthalene. In order to keep the naphthalene in solution at temperatures below its natural freezing point, nitrated derivatives of naphthalene are added, *e.g.*, nitronaphthalene, naphthylamine, etc.; and in order to obtain a homogeneous mixture, cresol is used. An alcohol may be substituted for the refined mineral oil, and the mixture completed by the addition of pure benzene and of ether or petroleum spirit.

The fuel is claimed to be cheap, devoid of acidity and of a quality comparable with the ordinary motor spirit. It does not give rise to deposits in the cylinder, nor necessitate the use of special carburettors.

C. V. H.

297. Fuel for Internal-combustion Engines. J. P. de la Riboisiere. U.S.P. 1,534,573 of April 21, 1925 (Appl., Nov. 18, 1924).

The fuel consists of hydrocarbons boiling above 160° a small proportion of an ether and a compound containing a non-hydroxy phenyl radicle.

T. A. S.

298. The Wiggins Floating Roof for Oil Tanks. J. E. Hackford. *Oil Engineering and Finance* **6**, 108, 190–191 (April, 1925).

The principle on which this roof operates is that when there is no air above petroleum in storage there can be no evaporation and no combustion. About 97 per cent. of the oil surface is covered by the roof, 2·9 per cent. is protected by a flexible seal between the float and the tank sides, and the remaining 0·1 per cent. is an annular opening which varies from nothing to ¼ in. in width and 22 in. in height.

When the tank is empty the roof rests on vertical supports, which are adjustable to within 1½ ft. of the bottom. Drainage devices are provided for removing rain or snow water from the roof. A large plate girder is attached to the top angle of the tank to compensate weakness due to the absence of the standard roof.

A series of fire tests carried out on a 30-ft. diameter tank failed to ignite the petrol contained in the tank, and evaporation tests have shown increased efficiency over the ordinary type of roof.

In the majority of cases the roofs erected to date have been on old tanks, and the flexible seal will work successfully on a tank as much as 20 in. "out of round." G. S.

299. Centrifugal Separators. Plauson's (Parent Company), Ltd. E.P. 208,548. Conv. (Germany), Dec. 13, 1922.

A rotating filter is provided, the periphery being in spring engagement with another wall. The material to be treated is discharged into the rotor and evenly distributed by plane or spiral ribs. It is thrown outwards on to the filtering surface, the filtrate passing through and being drawn off from a container. The solid particles are thrown to the periphery of the rotor against the spring disc. When the pressure on the spring exceeds the tension, an annular slit is formed and the material thrown out and collected. G. S.

300. Spraying Oil and other Fluids, Improvements in Devices for. A. E. Burton. E.P. 230,616.

A spraying nozzle lies within a cylindrical heat screen. The pressure of oil or other fluid forces the nozzle out of its casing, at the same time compressing a spring attached to the rear of the nozzle pipe. On cutting off the supply of liquid the spring expands and draws the nozzle back into the protecting cylinder. G. S.

301. Pumps for Oil-drums, Improvements in. J. H. Jones. E.P. 230,249.

A device for attaching a pump to an oil-drum is composed of a plate, having a hole for the reception of the pump, and provided with adjustable jaws to grip the edges of the drum, the pump boss thus being made to register with the bung hole of the drum. The pump suction is secured in the boss by a band having threaded ends. The band lies round the tube in the bush and the ends project through lateral holes in the boss and are tightened by nuts. G. S.

302. Removing Deposit from Tanks, Apparatus for. B. Bramwell. E.P. 229,521.

A suction nozzle is caused to travel across the floor of the tank, and a trailing squeegee is so arranged to be operative as such for any direction of movement of the nozzle. G. S.

303. Tanks, Improvements in. J. D. Ayre and Ransome Machinery Co., Ltd. E.P. 229,577.

Rectangular tanks are composed of steel plates which are flanged, the flanges being punched for attachment by means of bolts to adjoining plates. Adjacent sides are connected together by angle irons bolted to the flanges and stays are provided between sides and between side and bottom. G. S.

304. Collapsible Filling Funnel for Tanks. L. L. Dixson. E.P. 230,659.

A flexible funnel of oiled silk, rubber, or other material is held in two metal collars to which are secured strips of spring steel or wire, the whole sliding within a tube. The tube is threaded at the top to screw in place of the cap on the filling aperture of the tank, and is provided with a cap provided with a bayonet joint. On detaching the cap a spring forces the funnel out of the tube and the spring steel ribs expand the funnel ready for use. The funnel is closed by pressing down the cap and securing it by the bayonet joint. G. S.

305. Artificial Fuel and Methods of Making, Improvements in. J. R. Himman. E.P. 230,252.

Combustible waste material is ground and agitated with moist clayey earth in the ratio of one-fifth moist earth to eight parts by volume of waste. During the grinding, crude oil in the proportion of one-fourth of one part is added and the resulting mass subjected to pressure. The material is formed into convenient units and hermetically sealed in a combustible jacket, such as a paper tube or container. G. S.

306. Bituminous Emulsions, Improvements in or Relating to. H. A. Mackay. E.P. 229,361.

An aqueous bituminous emulsion is made by mixing an emulsifying agent to molten or liquid bitumen, and adding hot water to the mixture. The emulsifying agent is an organic amine, such as methylamine. Preferably trimethylamine is employed. In a modification of the process, a small proportion (say one-sixth) of the amine is replaced by a fatty acid (oleic acid) and alkali to neutralise this added with the hot water. G. S.

307. Improvements in or Relating to Bituminous Emulsions. Hugh Alan Mackay. E.P. 230,177 of Dec., 1923.

An emulsion, suitable as a binding medium in road-making or in the manufacture of coal briquettes or for similar purposes, is made as follows.

Not more than 5 per cent. of a protein (*e.g.*, casein) or a mixture of proteins is added to molten bituminous material, A dilute solution of alkali is then added, followed by boiling water.

It is characteristic of the invention that the protein and the alkali are added separately to the molten bitumen, the reaction products comprising the emulsifying agent being thereby formed in situ.

A small proportion of the protein may be replaced by a fatty acid, in which case sufficient alkali to neutralise the acid must be used in addition to the amount required by the protein.

Starch or other farinaceous substances may be employed in admixture with the protein emulsifier. Examples are given.

The emulsion will pour readily, is miscible with water in all proportions, and does not separate easily. C. V. H.

Testing.

308. Measurement of Absolute Viscosity of Light Distillates with the Saybolt Thermo-Viscometer. A. R. Fortsch and R. E. Wilson. *Ind. Eng. Chem.*, 1925, **17**, 291.

The Saybolt Thermo-Viscometer is used for those distillates lighter than gas oil, and while conversion factors to absolute units are available for the Universal and Furol instruments, no such factors have been worked out for the Thermo-Viscometer. This instrument consists of a long glass capillary, which is immersed in the liquid to be tested and blown empty by means of a bulb, the number of seconds required for the oil to rise to a definite mark after temperature correction giving the viscosity.

The authors determined the absolute viscosity of a number of light petroleum fractions by means of an Ostwald viscometer and correlated the results obtained with the Thermo-viscometer. It was found that while these petroleum fractions gave a straight line graph, other liquids showed a variation which was due to a difference in surface tension affecting the capillary rise.

By altering the level for these liquids this variation was partially overcome, but the method is considered to be fairly accurate only for a limited class of oils of similar surface tension. S. B.

Refining.

309. A New Type of Silica Gel. H. N. Holmes and J. A. Anderson. *Ind. Eng. Chem.*, 1924, **17**, 280.

Both silicic acid and ferric hydroxide, when dried, have been proved to give good adsorbent gels, and the authors made a mixed gel of these two acid and basic materials in the expectation of obtaining a better adsorbent than either singly. The mixed gel was made by adding 1440 cc. of 2·N. ferric chloride solution to 1000 cc. of sodium silicate solution of 1·375 density which had been diluted twenty times with water. The precipitated gel was dried in warm air, steamed, washed free from chlorides and activated at 135–145° C. for 12 hours. This gel adsorbed 43·2 per cent. of its weight of benzene from saturated air at 30° C. compared with 32·5 per cent. by silica gel. It was found, however, that if silica gel is washed after drying its adsorption is improved to 44·3 per cent. In order to increase the capillary spaces in the mixed iron-silica gel, treatment with dilute hydrochloric acid to remove ferric oxide was tried. Absorption of benzene was thereby increased to 50 per cent., although chemically the gel was identical with silica gel. This led the authors to try the effect of precipitating other metals with silica and removal of the metal as with iron. Al, Ca, Cr, Cu and Ni were employed and all proved more efficient after removal of the metal than before. After acid washing, the gel from nickel adsorbed 96·8 per cent. of its weight of benzene, and was three times as efficient as any of the others. With other liquids very different results were obtained, from which it was evident that every liquid had its optimum size of pore space. For the removal of sulphur compounds from petroleum fractions the new type of gel made by acid washing the metal-silica gel was found far more efficient than the ordinary silica gel, and also proved more effective in the removal of colour. For nitrogen adsorption from helium "gel from iron" had a time period of 35·5 minutes, compared with 26 minutes for silica gel, before the break in the adsorption took place. In the chloropicrin test, however, "gel from iron" proved only half as efficient as Bureau of Mines carbon. For adsorption and retention of toluene the Bureau of Mines carbon adsorbed 42·1 per cent. of its weight and retained 21·5 per cent. in a form not easily removable, whilst the gel adsorbed 56·25 per cent. and retained only 3·9 per cent. F. G. P. R.

310. Improvements in the Process of Manufacturing Decolourising Carbon and Apparatus Therefor. E.P. 230,293 of 5/4/24. Johan Nicolaas Adolf Sauer.

Decolourising carbon is made from raw or charred carbonaceous material by passing it downwards through a vertical or inclined retort. If raw material is used it is charred in the top portion of the retort and activated lower down. When working continuously, the retort is thus divided into permanent zones through which the material passes. First the zone where raw material is charred and where scavenging gases may be passed through the material from side to side of the retort. Then a lower zone where activation proceeds and activating gases may be passed through the material transversely to the retort chamber. These zones may be followed by others in which the material may be cooled and reheated, with or without the passage of inert gases such as chlorine. The function of the scavenging gases is to remove all non-carbonaceous material, leaving pure carbon for activation. Or the raw material may be mixed with substances which evolve gas in the retort and so assist in the activation. Examples are the chlorides of calcium, magnesium and zinc, alkaline earths, oxides, carbonates, phosphates. Examples of activating gases are steam, air, hydrogen, carbon monoxide and dioxide. C. V. H.

311. Treating Oils with Prepared Clay. I. A. Clark. U.S.P. 1,533,060.

The clay is washed with water and reduced to a muddied mass, without the addition of acid of any kind. The oil to be decolorised or purified is mixed with this mass and then heated to drive off the water. G. S.

312. Treating Hydrocarbons. C. W. Thompson and H. C. Beeler. U.S.P. 1,529,095.

The treatment of hydrocarbons to increase the saturation of the resulting oils is carried out by co-mingling the oil with a pulverulent or granular carbon containing material during treatment. This is effected by a converter, through which spent shale or such material is conveyed by a screw conveyer. The oil is passed through with the shale and heat applied, the vapours being drawn off from the top of the vapour chamber. Any vapours condensing in the region of the vapour outlet are returned to the converter before the heat zone is reached. G. S.

313. Treating Petroleum. W. A. Brown. U.S.P. 1,528,968.

For separating oil and water, a closed tank, with an inlet and an outlet, is provided with longitudinal pans sloped in alternate directions, so that the liquid will flow from the lower end of one pan on to the higher end of the next lower pan. Steam pans are arranged over flat troughs in the pans so that the liquid is concentrated in flat, thin streams. A heating coil is provided near the bottom of the tank, and means provided to keep the liquid level above this coil so that the upper layer only is heated without causing further heating and generation of water vapour in the oil and water mixture layer below. G. S.

314. Improvements in Process of Decolourising Petroleum Distillates. E.P. 213,881 of Dec., 1923. Union Oil Co. of California (Assignees of Ralph Carleton Pollock).

The expensive acid and soda washes, as well as the preliminary treatment of a decolourising clay are eliminated by this process.

The distillate (preferably gasoline) is agitated with a mixture consisting of 1-40th to 1-5th lbs. of sulphuric acid of 50 to 98 per cent. strength for each barrel (42 gals.) of gasoline; and ground clay in the proportion of 0·1 to 2 lbs. per barrel of gasoline. Thorough agitation produces a gasoline decolourised and neutralised and ready for the market.

If excess acid is used the gasoline retains its pinkish colour, and if excess of neutral or alkaline earth is used the gasoline is decolourised, but the colour returns on standing. The proportions must therefore be varied within the above limits to produce the desired effect on the particular gasoline treated.

The clay may be practically any of the decolourising clays now in use. It is used raw without preliminary treatment. No acid sludge is formed.

C. V. H.

315. Process of Purification of Hydrocarbons. U.S.P. 1,526,665 of Feb. 17, 1925. Application date June 21, 1922. Dr. Lazar Edeleanu and Wilhelm Hess.

The process comprises the treatment of the hydrocarbons with liquid sulphur dioxide in stages, so as to separate those bodies which are readily soluble from those which are not, without taking out too large a percentage of valuable components of the oil. For example, certain saturated bodies, which are valuable components of the oil and should not be removed, are soluble to some extent in liquid sulphur dioxide, and repeated extractions with the fresh liquid will remove an appreciable proportion of them. By this invention, however, the oil is first extracted with liquid sulphur dioxide which has previously been used three times, and is therefore saturated with the bodies that it is not desired to remove, and so will not extract any more, although still capable of removing the readily soluble unsaturated bodies. The next extraction is carried out with sulphur dioxide which has been used twice before, and is followed by extraction with once used SO_2 and finally fresh SO_2. This method reduces the quantity of fresh SO_2 required, and also the quantity of used SO_2 to be evaporated, at the same time minimising the loss of valuable components of the oil. Substantial economy is therefore effected.

C. V. H.

316. Process for Treating Acid Sludge. G. Egloff and H. P. Benner, Assrs. to Universal Oil Products Co. April 28, 1925. Appl. May 16, 1921.

Acid sludge is distilled under pressure. Acid and light oils are removed as vapour and separated after condensation.

T. A. S.

317. Treatment of Acid Sludge. G. Egloff, Assr. to Universal Oil Products Co. U.S.P. 1,535,213. April 28, 1925. Appl. May 16, 1921.

Acid sludge is distilled under a vacuum of at least 12 inches of water, the products being separately collected.

T. A. S.

318. Refining of Mineral Oil. H. T. Maitland, Assr. to Sun Oil Co. U.S.P. 1,533,325. April 14, 1925. Appl. Dec. 4, 1920.

Distillate from a still is mixed with sulphuric acid and agitated with air whilst flowing through a tank. The oil and acid sludge are passed through a centrifugal machine.

T. A. S.

310. Oil Still. P. Heffler, Assr. to H. C. Simmons. U.S.P. 1,527,871. Feb. 24, 1925. Appl. Jan. 24, 1924.

The still is mounted on a furnace setting, one end of which contains two sets of chequer brickwork. Hot gases from the combustion space are passed alternately through each set of brickwork, air being drawn through the other set of brick work. The induced air is made to pass under the still and then join the products of combustion before passing through the other chequer work. T. A. S.

320. Art of Petroleum Distillation. T. S. Cooke, Assr. to Standard Oil Co. U.S.P. 1,526,834. Feb. 17, 1925. Appl. Feb. 23, 1918.

Oil is passed in continuous stream through a series of stills maintained at increasing temperatures in the direction of flow of the oil. The vapours from each still are passed through a fractionating column, whereby all vapours condensing below a predetermined temperature are returned to the stills. T. A. S.

321. Process and Apparatus for Refining Oils. R. A. Dornes, Assr. to Darwin Manufacturing Co. U.S.P. 1,526,534. Feb. 17, 1925. Appl. Nov. 27, 1912. Renewed Sept. 13, 1920.

Oil is vapourised and partially purified by submitting the vapours to a series of expansions and reheatings. The vapours are then mixed with steam and submitted to a further succession of expansions and reheatings. The vapours are then subjected to different pressures and temperatures to condense products therefrom. Alcohol may be mixed with the vapours in addition to steam. The condenser consists of a chamber in which zones of different temperature may be maintained. T. A. S.

322. Apparatus for Separating Oil from Oil-Bearing Sands and Rocks. W. J. Reilly. U.S.P. 1,529,505. March 10, 1925. Appl. Feb. 17, 1922.

Oil bearing material is fed into a horizontal still fitted with a rotating agitator-conveyor which delivers the material, after treatment, to separators. A heating element is attached to the other end of the still and connected by an inclined pipe to exit for spent material, so that the heating medium may be circulated. Vapours are removed from the still. T. A. S.

323. Apparatus for Refining Oil. W. J. Reilly. U.S.P. 1,529,504. March 10, 1925. Nov. 12, 1921.

A still for the fractionation of oil consists of three oil drums connected by banks of tubes to form a triangle, the apex being at the bottom. One of the tube banks is heated by furnace gases so that oil circulates round the system. A vaporising drum is connected to the two upper oil drums and is fitted with inclined vaporizing surfaces. Hot oil is elevated from one of the upper oil drums and, after running over the vaporizing surfaces, is returned to the other upper drum. Vapours are removed from the vaporizing drum. T. A. S.

324. Petroleum Still. W. D. P. Aims. U.S.P. 1,528,520. March 3, 1925. Appl. Sept. 30, 1920.

A heat insulated vessel, having a top outlet for vapour and a bottom outlet for residue, is fitted with a series of superposed heating elements controlled by external valves. Oil is fed into the top of the vessel and directed on to the heating elements by means of slit-bottomed troughs. T. A. S.

325. Extraction of Liquefiable Constituents of Gases. E. Schill and F. Woidich, Assr. to Gas Compressing Corporation. U.S.P. 16,052. April 21, 1915. Appl. May 28, 1924, *cf. J.*, 1922, 450 A.

A rough separation of the liquefiable constituents of natural gas is made, the lighter, and heavier constituents being then separately introduced at appropriate points into a rectification column. T. A. S.

326. Distilling Petroleum Oils. G. H. Fifield. U.S.P. 1,535,457. April 28, 1925. (Appl., April 26, 1920.)

Oil is distilled in a fire heated cylindrical still having a steam pipe along the bottom and longitudinal heating pipes, having a greater surface area than the heated portion of the still, disposed centrally in the still. The bottom of the still is maintained above 560°, steam is injected and the heating pipes are maintained at 400°. T. A. S.

327. Apparatus for the Fractional Condensation of Mineral Oils. K. Fuchs. E.P. 209,771. Jan. 14, 1924. Conv. (Austria), Jan. 13, 1923.

Fractional condensation is carried out in dephlegmator columns, a distinguishing feature of which is that the condensed liquid that is formed is conveyed in the final part of its course in such a manner that it is exposed to the heat of the incoming vapours without coming in direct contact with them. T. A. S.

328. Fractional Distillation of Oils. D. Pyzel. E.P. 231,334. April 22, 1924.

Condensates of desired characteristics are obtained from oil by passing the vapours through a dephlegmator, through which is circulated a stream of cold liquid identical with the desired condensate. T. A. S.

329. Distilling and Purifying Mineral Oils. W. B. Lindsay and W. B. Davidson. E.P. 232,347. Jan. 23, 1924.

Oil, which has first been topped to remove light spirit, is further distilled by bringing it in contact with hot gases. The gas used consists of fresh flue gas at 3000° F., mixed with 2 or 3 times its volume of gas which has been once previously used, the temperature of the mixed gases being about 1000° F. 30,000—40,000 cu. ft. of this gas will vaporize about 1 ton of crude oil. The oil is sprayed into the gas or run over contact material over which the gas is passing. The oil vapours and gas are passed into a series of fractional condensers or scrubbers, preferably of the centrifugal type, and in these purifying operations may be carried out—*e.g.*, S may be removed by blowing in finely divided iron with superheated steam. Uncondensed gases issuing from the last scrubber are washed to remove any mist of oil, and returned, after rejection of part, to be mixed with fresh furnace gas for further use. The hot gas is best produced by burning producer gas with the calculated amount of air so that a gas consisting of 20 per cent. CO_2 and 79 per cent. N_2 is obtained. T. A. S.

330. Fractional Distillation. C. H. Borrmann. E.P. 231,686. May 2, 1924.

Oil is pumped through a heating tube into a separator where vaporisation of a portion takes place, the vapours being passed through a succession of

columns in which fractional condensation takes place. The unvaporised oil from the separator is pumped through a second heating coil to a second separator, where residual oil is again separated and the vapours are again taken through a succession of columns.

Where steam is necessary, this is admitted into the separator by a tube which is covered by the body of oil maintained in the bottom. The two heating tubes are mounted in the same furnace setting, and so arranged that the tube through which the heaviest oil is being passed is first heated by the furnace gases. The rate of flow through the heating tubes can be independently controlled, a speed of ·5 to 1 metre per second being suitable.

T. A. S.

331. Oil Dephlegmator. Joseph Price. U.S.P. 1,530,325.

The objects of the invention are to provide an apparatus in which only the heavier fractions of petroleum vapour are condensed, thus avoiding the necessity of re-evaporating the lighter fractions; the condensed heavy fractions and the vapours of the light fractions are separated efficiently; the condensation temperature may be regulated and at the same time automatically maintained at a fixed value; heat transfer of maximum efficiency is obtained, and the design is such that the dephlegmator is inexpensive and effective while convenient for dissembling, for cleaning or repairing.

The apparatus consists of a shell containing tubes bent out of the perpendicular and fixed into a plate at each end. A casing at top serves to connect the apparatus to the still. Bent tubes are used preferably in order to facilitate the removal of scale or other deposit, as the tube may be flexed by subjecting it to sudden changes of temperature. A separating chamber is fixed to the bottom plate. The vapours from the still pass downward through the condensing tubes into the separating chamber partly as condensate and partly as vapour, which issue through openings arranged for the purpose.

The cooling liquid (water) is contained in the shell surrounding the tubes. A float on the surface of the water actuates a valve to regulate the feed, and a back pressure valve on the outlet from the vapour space above the water maintaining the pressure at a fixed figure.

The steam being saturated, there will be a definite temperature corresponding to the pressure which the valve may be set to regulate. To utilise the steam passing out, it may be conveyed into a heat exchanger to preheat the feed water. By heating the feed water to approximately the temperature of the water within the shell, the temperature along the entire length of the condensing tubes is nearly constant at the proper value for condensing only that part of the vapours desired and avoiding condensation of the lighter fractions. The water in the shell is in a state of constant agitation which serves to maintain a uniform temperature throughout and a high rate of heat transfer effected.

A modified form of the apparatus in which the flow of the vapours is up instead of down is similar in construction.

R. P.

332. Oil-Distilling Process. H. A. Hills. U.S.P. 1,529,067.

Gasoline containing grease and suspended matter is first passed at high speed over a surface heated by vapours of distillation. It is then introduced into a still, where it is subjected to heat while being kept in a state of violent agitation. Means are provided for keeping the liquid level in the still constant.

G. S.

333. Separating Composite Oils into Component Parts. F. E. Van Tilburg. U.S.P. 1,532,456.

A battery of stills and dephlegmators is provided, and the condensate forming in the first dephlegmator passes to a pan in the second dephlegmator, and from there, through pans in the other dephlegmators to an auxiliary still. The condensate is here subjected to the heat of vapours from one or more of the main stills and so redistilled. G. S.

334. Evaporating the Volatile Constituents of Solutions, Emulsions and Suspensions. F. Wreesmann. B.P. 228,747.

The liquid is fed to a centrifugal device in the centre of a cylindrical evaporating chamber, where it is atomised horizontally towards all sides. The major portion of the dessicating agent is introduced from a centrally located tower in the base of the chamber, a smaller amount being fed through annular jets in such a manner as to form two layers, one above and one below, parallel to the layer of atomised solution. The dessicating agent laden with the volatile constituents is conducted through an outlet at the top of the chamber. G. S.

335. Heating Liquids by Introduction into Molten Metal. Sir Arthur McDougall Duckham, K.C.B., and John Stanley Morgan, Assrs. to Thermal Industrial and Chemical Research Company, Limited. U.S.P. 1,527,847 of Feb. 24, 1925. (Appl. June 21, 1921.)

This apparatus comprises a container for molten metal heated by flue pipes. Lead or other metal or alloy is used. A duct of long, narrow, annular horizontal cross-section opens below the normal level of the molten metal, and is connected with a pipe (not in contact with the metal) through which the liquid may be discharged under pressure to keep the duct full of liquid. This method avoids the clogging of the apertures, through which liquid is usually introduced into molten metal, and also effectively reduces the high pressures normally required. Above the level of the molten metal two outlets are provided—one for vapours and one for residue. C. V. H.

336. Method of Distilling Volatile Liquids. John H. Wiggins. U.S.P. 1,527,944 of Feb. 24, 1925. (Appl. May 12, 1921.)

Oil or other volatile liquid is delivered to a closed chamber, a partial vacuum created and the vapours withdrawn. These vapours are then compressed and, at a higher temperature, passed through a heat exchequer to evaporate fresh oil. The vapours are then condensed and collected. By this means substantially 100 per cent. of the latent heat supplied in the vapourisation of the oil is recovered in the condensation of the oil and transmitted to the incoming oil. C. V. H.

337. Apparatus for Refining Crude Hydrocarbons. William E. Chenot. U.S.P. 1,531,074 of March 24, 1925. (Appl. Jan. 10, 1920.)

The inventor claims a method of and apparatus for distilling hydrocarbons, which eliminates the necessity for subsequent refining. The apparatus consists of a still fitted with a large vertical column, of uniform diameter, quite unobstructed inside, and having a capacity of one-half to several times the capacity of the still. The height of the column will thus vary from

10 to 40 ft., and the diameter may be half that of the still. The column is fitted with several tapering pipes at intervals up its length, which lead to condensers. These pipes are inclined upwards, the top one serving to carry off the lightest vapours, while the lower ones are brought into use when the temperature is such that the heavier fractions are being distilled.

The mechanism of the separation of the fractions is as follows: the still is heated and the crude oil vapours rise in the column (or precipitating chamber), where they are kept in the vapour phase by the heat from the still. While they are suspended in the precipitating chamber the vapours separate out by gravity, the lightest rise to the top and the heaviest fall to the bottom. Some of the heavy vapours condense and fall back into the still, where they are re-heated. The lightest vapours enter the top side arm (which is the only one open at the beginning of the distillation) and pass over to the condenser. This side arm itself acts as a partial condenser effecting an additional separation. When all the motor spirit has passed out of the precipitating chamber, the top side arm is closed by a valve, and the next lower side arm opened for the removal of illuminating oil. Similarly, when this has passed over a still lower side arm is opened for the removal of the lubricating oil fraction.

It is claimed that this method produces as effective a separation as several fractionations by the usual method; that the products are clean and sweet and need no chemical refining; that the loss of light vapours caused by re-running is avoided, and that the method is suitable for both continuous and discontinuous distillation.

It is preferable to use open steam in the still as this assists the vapourisation very materially. C. V. H.

338. STILL. Robert H. Lindsay. U.S.P. 1,529,030 of Dec. 16, 1921.

The still is a pipe still, in which the oil flows by gravity through a zig-zag pipe disposed vertically in a furnace. The vapours formed are taken off by vertical pipes leading from the top of the vertical coil into a vapour line, while the residue flows on through the coil and so out of the furnace. The furnace is heated by an oil burner working on compressed air, which is heated in the same furnace. C. V. H.

PURE CHEMISTRY.

339. THE CHEMISTRY OF PETROLEUM.—I.: THE OCCURRENCE OF COMPOUNDS OF SULPHUR IN THE LIGHT DISTILLATE FROM THE CRUDE OIL OF MAIDAN-I-NAFTUN. S. F. Birch and W. S. G. P. Norris. *Journ. of Chem. Soc.*, 1925, vol. 127, p. 898.

The light distillate (36 per cent.) from crude Persian petroleum (Maidan-i-Naftun) has been found to contain elementary sulphur, hydrogen sulphide, ethyl, *iso*propyl, *iso*butyl and possibly *iso*amyl mercaptans, together with a series of neutral sulphur-containing substances which react with mercuric chloride, probably alkyl sulphides. In refining, the soda wash completely removes the hydrogen sulphide and part of the free sulphur (in the form of sodium polysulphide); varying amounts of the mercaptans depending on their relative acidities are also removed. The acidities of the mercaptans decrease rapidly as the homologous series is ascended; thus although 97 per cent. of ethyl mercaptan was removed by sodium hydroxide solution under the conditions employed, only 33 per cent of *iso*-amyl mercaptan could be extracted under similar conditions. The mercaptans, together with the corresponding disulphides, are found in the distillate when the "spent-soda" is distilled, the latter being formed by oxidation of the mercaptans by

the sodium polysulphide already present. The mercaptans were obtained free from the disulphides by extraction with a very concentrated solution of potassium hydroxide (50 per cent.) and subsequent cooling and acidification of the potash solution. From the mixture of mercaptans obtained, those named above were isolated by fractional distillation. Fractionation of the mixed disulphides led to the isolation of diethyl, di*iso*propyl and di*iso*butyl disulphides.

S. F. B.

Lubricating Oils.

340. The Distillation of Petroleum Lubricating Oils with Extended Evaporative Surface. S. Suknarowski and D. Wandycz. *Petroleum*, 1925, **21**, 641–650.

The substitution of internal heating and evaporation from an extended surface for heating through the bottom or fire tubes of a still is more effective than the use of vacuum or steam distillation as a means of preventing cracking decomposition of the oils. The efficiency of steam distillation is reduced by the want of rapidity of evaporation and diffusion in the steam bubbles, and the use of benzine vapour as a means of heating resulted in the same distillation being effected by 60 per cent. of that vapour as with 100 per cent. of steam. Experimental distillation was carried out in the laboratory with a modification J. Mosicicki's system, on distillation residues from the crude oils of Potok, Krosno, Kroscienko-Potok, Bitkow and Boryslav, the former three being free from paraffin wax and the latter two containing paraffin wax. A small still and superheater served to evaporate the benzine and superheat its vapour. The vapour was passed upwards through a column filled with corrugated metal sheets till the latter attained the desired temperature, when the material for distillation was admitted at the top of the column and underwent evaporation as it descended, the residue flowing from the bottom of the column. The vapours passed in at the bottom of a second similar column, which acted as a condenser, the benzine vapours and some portion of the distillates being condensed in a subsequent water condenser, while a small portion of the benzine condensed with the distillate in the column. The residues were redistilled, fractional distillation taking the place of fractional condensation. The amount of benzine vapour required was 3·7 times the theoretical amount, this being partly due to the intermittent operation. Detailed tables are given of the progress of the distillation and the yields of products in each case. The products greatly surpassed those of high vacuum distillation both in high viscosity and high flash point. An attempt to diminish the quantity of benzine vapour used resulted in serious retarding of the rate of distillation.

H. M.

341. Examination of a Turbine Oil Sludge. A. Salathe. *Ind. and Eng. Chem.* **17**, 415.

The sludge from oil which had been used in a large turbine was found to consist of an emulsion of oil and water with adsorbed solids. Separation of the water was effected with petroleum ether. The aqueous layer contained copper and calcium sulphates and sulphuric acid. The dry sludge had a high saponification number indicating the presence of acids, esters and soaps, and contained lower fatty acids, naphthenic acids and acetaldehyde.

R. W. L. C.

342. Reclamation of Automobile Crank-Case Oil. C. V. Brunt and P. S. Miller. *Ind. and Eng. Chem.* 17, 417.

The dilution, oxidation and cracking which a crank-case oil undergoes in service are discussed. The waste of lubricating oil caused through periodical scrapping and the wear of engines caused by diluted oil are emphasized. The utility of reclamation devices as accessories to the engine is questioned, as filtration is out of the question owing to the colloidal nature of the suspended matter, while rectification alone would probably cause gumming and choking of oil ways through separation of metallic soaps.

A reclamation process has been developed in which the clarification of the used oil is effected by brief agitation with a small amount—2·5 per cent.—of sodium silicate solution (sp.gr.1·37 $Na_2O : S_1O_2$ ratio 1 : 3·3) 0·5 per cent. acid manganese resinate and 0·1 per cent. of stearic acid are added to the oil to aid the separation of sludge. If the oil immediately after shaking with the clarifying agents is poured on to a layer of water, the settled matter will sink into the water leaving a clean oil-water interface. Neutralisation of any acidity is effected by the alkali of the sodium silicate. Rectification of the clarified oil is carried out by passing it in thin films over electrically heated inclined plates in a current of air. A continuously acting reclamation apparatus embodying these processes is described. The machine has a capacity of 8 to 9 gallons of oil in 24 hours.

The cycle of engine use and reclamation of lubricating oil may be carried on continuously, a portion of the used oil being withdrawn from the crankcase and reclaimed oil added to replace it. Thus, using a system whereby a litre of oil was withdrawn daily from a 5-litre crankcase reclaimed and returned, keeping in all 8 litres of oil in use and in process, the same oil was used for about three years or 16,000 car miles, adding only the very small amount of fresh oil required to replace actual consumption. Satisfactory service was obtained and no undue wear of the engine observed. A preceding 15,000 miles run by the same car during which the oil was changed in the usual way every 400 to 500 miles had shown a distinctly less satisfactory performance.

R. W. L. C.

343. Art of Filtration. E. M. Clark and F. A. Howard, assrs. to Standard Development Co. U.S.P. 1,528,427, March 3, 1925. Appl. Dec. 22, 1920.

Heated slack wax is applied to filters to remove the wax filtered from chilled oil.

T. A. S.

344. Processing Hydrocarbon Lubricating Oils. H. G. Fowler, assr. to Associated Oil Co. U.S.P. 1,534,376. April 21, 1925. Appl. Oct. 16, 1923.

Lubricating oil is treated with acid and then with alkali. The alkali is quickly settled out by heating the oil and the oil is then treated with a decolourizing agent.

T. A. S.

Cracking.

345. The Hydrogenation and Liquefaction of Coal (*continued*). H. G. Shatwell and J. Ivor Graham. *Fuel* 4, 2, 3.

The authors continue and conclude their paper on the hydrogenation of coal by giving details and analysis of experimental work on the liquefaction of clarain, durain, fusain and coal of high carbon content. It is concluded from these results that: (1) The possibility of hydrogenating and partially

liquefying a constituent of a typical British bituminous coal without the aid of catalysts has been definitely established and a substantial yield of oil obtained.

(2) The nature of the prepared liquid has not been elucidated, but it contains oxygen and is nearly free from sulphur.

(3) The nature of the action of phenol or mineral oil in promoting liquefaction is not clear. It is probable that the viscous products are dissolved by these liquids, leaving a new surface in contact with the hydrogen.

R. P.

346. Primary Products from Oil Cracking. *Petr. Times* **13**, 316.

With particular reference to the Dubbs process, this article, based on Mr. J. C. Moorell's paper (*Chem. and Met. Eng.* **31**, 1006; *Journ. Inst. Petr. Techn.* **11**, 48), gives information regarding the treatment of cracked gasoline to render it marketable, and characteristics and analysis of the fuel residue, coke, and permanent gases obtained in cracking. R. P.

347. Refining of Cracked Distillates in the Vapour Phase. T. T. Gray and M. R. Mandelbaum. *Nat. Petr. News* **17**, 11.

This paper gives further particulars of the Gray process for refining cracked distillates by treatment, with fuller's earth, in the vapour phase.

The desirable constituents of cracked spirit, paraffins, naphthenes and olefins, are stable on standing and to the action of fuller's earth in the vapour phase, whereas diolefins, which rarely exceed 1 per cent. of the distillate, are unstable, on standing or on evaporation, depositing gum and going off colour. They polymerise also on treatment with fuller's earth. This treatment is therefore considered a great improvement on the usual acid refining method as the difficulties encountered with the latter are eliminated.

In acid treatment of cracked spirit paraffins and naphthenes are inert, but aromatic compounds are sulphonated and olefins are absorbed or polymerised. The removal of aromatic and olefinic compounds by absorption and the raising of the end point by polymerisation results in loss of a considerable amount of spirit. Besides these chemical losses there are the mechanical losses, particularly in batch treatment, and the serious disadvantages of disposal of acid sludge and high depreciation charges on washers and re-run stills.

The Gray process has already been described (*J. Inst. Petr. Techn.* **11**, 48, 21A).

In a large scale unit the tower contains 6 tons of half-roast fuller's earth. This amount has been found to refine over 7800 barrels of pressure distillate. Comparison between acid washing and vapour phase fuller's earth treatment, working side by side on a works scale, shows a profit of 38 cents per barrel in favour of the Gray process.

The quality of the product after fuller's earth treatment is superior to the acid treated oil excepting only in sourness due to sulphur compounds. An ordinary sour distillate remains sour and requires sweetening. Hypochlorite is used for desulphurising the finished product. R. P.

348. Two Improvements Greatly Increase Dubbs Plant Efficiency. Paul Truesdell. *Nat. Petr. News* **17**, 7.

One of the improvements is an adaptation of the Leintz furnace principle to the furnace of the Dubbs plant and the other is the development of hot oil pumps to re-cycle the hot condensate from the dephlegmator.

The first improvement increases furnace efficiency, thus reducing fuel cost. So far only one plant has been fitted and its operation is reported to have made startling savings on the fuel bill. Several refiners, however, have rejected it as they consider the capital cost too high.

The Dubbs furnace is built in two sections consisting in a furnace chamber and a cracking chamber. A fire brick wall with slots or holes at the top separates them. The combustion chamber is fitted with oil and gas burners at each end and the hot gases pass over the wall to come in contact with the bank of cracking tubes through which the oil is circulated. Beneath each of the burners there are dampers for admission of air, but through some fault in design difficulty has always been encountered in raising the oil to the required temperature. In order to obtain sufficient velocity of the hot gases, it was necessary to admit an excess of air through the dampers. The excess of air caused an increased fuel consumption and much of the gases went up the stack unburned. In the new furnace a bank of tubes is placed in the flue leading from the cracking chamber to the stack and the dampers are bricked up so that no cold air is drawn into the furnace except over the bank of tubes. The burners are placed at one end of the furnace chamber and are constructed to exert the proper suction to draw the required amount of air for combustion into the fire box, from the air preheater. The preheated air attains a temperature of about 300° C. before reaching the furnace. Even with this improvement some of the gases were incompletely burned and a gas recirculating device was put at the other end of the furnace chamber. This consisted of a flue and a 28 in. high speed fan to return the hot gases from the cracking chamber into the combustion chamber to complete the combustion. The fan is operated by a small powerful steam turbine, which runs on water-cooled ball bearings.

In this way the temperature of the flue gases in the stack has been reduced from 535° C. to about 250° C. and the amount of fuel used has been reduced from 7·6 per cent. to 1·6 per cent. of the oil charged. Those figures refer to oil consumption only and do not include the gas consumption.

The second improvement consists of a pump to handle hot oil. In the original plant the hot condensate from the dephlegmator ran down a long tube into the raw feed pipe by gravity, but the recycling of the reflex oil was slow and uncertain and a hot oil pump was designed to give force to the returning stream of oil.

This pump is a duplex, double-acting piston steam pump, the valves of which are placed at a considerable distance. Pipes 24 ft. long connect the pump with the valve boxes and are filled with cold oil. The pump works on this cold oil, drawing it in and forcing it out over and over again and this action draws hot oil through the valves and forces it along the feed line. When the oil in the 24 ft. pipes becomes hot by convection, cold oil can be introduced between the pump and the valves. R. P.

349. Production of Petroleum-like Hydrocarbons from Fatty Acids, Glycerides, and Vegetable and Animal Oils.—A. Maillie. E.P. 218,278 of June 18, 1924 (Conv., France, June 28, 1923).

A product similar to petroleum is prepared from animal and vegetable oils, solid and liquid glycerides of all kinds and from fatty acids of the higher group, by effecting their decomposition by heat in contact with a dehydrating and polymerising chloride or metal oxide at ordinary or higher pressures followed, or not, by treatment with a more active polymerising agent. The catalytic agents used are the chlorides or oxides of calcium, barium, strontium, magnesium, potassium and tin. The metallic salt, to the extent of 10—20 per cent. of the glyceride to be treated, is mixed with the fatty matter and

placed in a still where the temperature is raised to 350°—450°. Water and fatty matter distil off, the latter being returned. A petroleum like liquid distils off and when this ceases the temperature is raised to 500° when heavier oils are produced. By fractionation of the product there is obtained petrol boiling to 150° and having a density of 0·73, lamp oil burning tp 275° and heavy oils boiling to 330°.

The heavy oils by treatment with zinc chloride at 250°—350° C. may be partially converted into more viscous oils. Fifty to 65 per cent. of the oil treated can be obtained as hydrocarbon. T. A. S.

350. Improvements in Apparatus for Cracking Hydrocarbons. F. G. Niece. E.P. 230,339 of July 11, 1924.

Apparatus in which oil is cracked by bringing it in contact with molten metal is improved by providing means for returning uncondensed gas to a sheath surrounding the vertical tube which conveys the oil to the bottom of the molten metal bath in which cracking takes place. By this means the deposition of carbon in the tube is prevented and the need for asbestos or other lagging, which rapidly becomes disintegrated, is obviated. The tube conveying the oil to the bottom of the metal bath, and the jacketing tube are bolted to a flange at the top of the bath to enable them to be removed together and also by being anchored only at one end are free to expand and contract without causing buckling. T. A. S.

351. Cracking Hydrocarbon Oils. H. C. Wade. U.S.P. 1,530,587 of March 24, 1925 (Appl., July 15, 1921).

Water is heated in a closed container to above 100° and then allowed to expand into a chamber along with hydrocarbon oil. The steam and hydrocarbon vapours produced by the explosive action of the sudden free expansion of the water on the oil are passed through a cracking coil.

T. A. S.

352. Process for Cracking Oil. C. W. Thompson and H. C. Beeler. U.S.P. 1,530,627 of March 24, 1925 (Appl., Sept. 19, 1922).

Liquid hydrocarbons mixed with an inert solid carrier are passed through a retort where they are submitted to zones of increasing temperature. The lightest portion of the vapours is removed and condensed, the heavy vapours being separately condensed and returned for treatment on the inert carrier.

T. A. S.

353. Process of Treating Hydrocarbon Oil. C. W. Thompson and H. C. Beeler. U.S.P. 1,529,095 of March 10, 1925 (Appl., Sept. 29, 1921).

Oil is mixed with gravel and fed into a horizontal retort fitted with a conveyor. Vapours are removed in successive stages along the retort, insufficiently cracked oil being returned to the gravel before heat treatment. The operation is carried on at atmospheric pressure. T. A. S.

354. Treatment of Oil. G. Egloff and H. P. Benners, assrs. to Universal Oil Products Co. U.S.P. 1,535,211 of April 28, 1925 (Appl. Oct. 23, 1920).

Purified carbon is obtained from cracked petroleum residuum by filtering out the carbon and washing it with solvents. T. A. S.

355. Recovery of Aluminium Chloride. A. M. McAfee, assr. to Gulf Refining Co. U.S.P. 1,534,130 of April 21, 1925 (Appl., Jan. 26, 1922).

Residues containing aluminium chloride are boiled with oil. The evolved vapours are cooled to condense the aluminium chloride and high boiling oil which are separated. T. A. S.

356. Apparatus for Cracking Petroleum Oil. Power Specialty Co., assrs. of J. Primrose. E.P. 209,754 of Jan. 10, 1924 (Addition to E.P. 179,493 of Nov. 26, 1920). *J.*, 1922, 489A.

The tubes in which oil is heated for cracking purposes are encased in graduated casings to ensure even heat transference. The walls and roof of the combustion space are also fitted with tubes. Tubes in the actual combustion space are also fitted with casings of refractory material to prevent overheating. Tubes in the heating space, which do not come in contact with gases at so high a temperature as those in the combustion space are encased in corrugated tubes so as to expose more heating surface. The area of the corrugations is so calculated that equal heat is transferred to the oil in its path through the tubes although the temperature of the heating gases is lower nearer their exit from the heating chamber than at their entrance. T. A. S.

357. Cracking Hydrocarbons. R. Egeland. U.S.P. 1,533,839 of April 4, 1925 (Appl., Oct. 17, 1921).

Hydrocarbon oil is circulated through a tubular heating unit and a cylindrical still. Whilst passing through the tubular heating unit gas is added. Light vapours are removed from the still and condensed. Additional heavy oil and gas are added as required. T. A. S.

358. Improvements in Method of Converting Heavy Hydrocarbons into Gasoline and Light Hydrocarbons. C. W. Golby (Comm. from Gasoline Products Co.). E.P. 232,283 of Dec. 10, 1923.

Hot oil, released from the reactor of a cracking unit, is mixed with heated natural crude or fuel oil which has been heated in a tube still at 100 lb. pressure to 370°. The mixture is vapourised in a chamber, the vapours consisting of gasoline, kerosene and crude oil being passed through a dephlegmator where after separation of the gasoline the gas oil is returned to the plant for cracking. This method of operation prevents the formation of carbon in the cracking plant by giving a better cracking stock and better fuel residues are obtained. Considerable heat economy is effected. T. A. S.

359. Process for the Constructive Conversion of Heavy to Light Hydrocarbons. William Edward Shore. E.P. 231,625 of April, 1925.

The inventor claims a process and apparatus for converting heavy hydrocarbons into light hydrocarbons by mechanically breaking up the heavy oils in presence of hydrogen bearing gases, then raising the temperature of the mixture by the further application of mechanical energy.

Heavy oil is first heated in the jacket of an internal-combustion engine, which operates a compressor and a mechanical nebuliser; it is then passed through the compressor jacket, and through a heater, heated by the engine exhaust. The oil is mixed with hydrogen containing gases and nebulised, thereafter passing through the engine exhaust heater again. The mixture

is directed through coils heated by the expanding gases from the compressor, then compressed adiabatically and expanded into drums containing the heating coils, then progressively condensed by passing the vapours through hydrocarbon liquids of various specific gravities to separate the products.

The jacket surrounding the nebuliser is connected in closed cycle with a heater for producing mercury vapour, to impart a high temperature to the expansion chamber of the nebuliser. R. P.

360. Improvements in Processes for Treating Crude Petroleum and other Hydrocarbons to Increase the Yield of Lighter Products. George Gane. E.P. 206,121 of March, 1925.

Crude petroleum, containing petrol, or to which petrol has been added, or any mixture of light hydrocarbons with heavier hydrocarbons containing kerosene fractions, is heated until a pressure not exceeding 10 atmospheres at a temperature of 100° to 300° C. is attained and then distillation is effected. The reaction is more efficient and more immediate if the vapours, under pressure, come into contact with a catalyser such as iron or copper.

The reaction does not take place without certain drawbacks, unless the oil to be treated contains kerosene. With crude petroleum the petrol increases at the expense of the kerosene fraction, the latter being diminished by an amount exactly equal to the increase of petrol.

According to experiments it is easy to obtain an increase of 5 to 6 per cent. of petrol, distilling under normal pressure up to 100° C., by submitting to a pressure of 8 to 10 atmospheres a petroleum containing either naturally or by addition 10 to 15 per cent. of petrol. R. P.

361. Apparatus for Treating Hydrocarbon Oils. Gustav Egloff and Harry P. Benner. U.S.P. 1,524,818 of Feb., 1925.

The object of the invention is to provide a construction which obtains a maximum efficiency and utilisation of heat, in cracking, and which at the same time prevents local deposition of carbon on the lower part of the still. The plant consists of a cylindrical still, having a corrugated flue running centrally through it. The hot furnace gases pass through the flue, then round the upper half of the still, to the stack.

A flushing nozzle with a number of jets extends into the still, circumferentially around the heating tube. By this arrangement the oil is introduced into the still and constantly sweeps across the hot surface of the heating tube, at relatively high velocity, in the form of jets of spray, which tend to clean the carbon from the heating tube.

The oil level in the still is maintained somewhat above the top of the heating tube. Carbon tends to fall to the bottom of the still with the heavier residue and can be constantly run off. The distillate passes through the dephlegmator and the vapours pass through a condenser into a receiver, while the condensate from the dephlegmator runs back into the still.

R. P.

362. Hydrocarbon Oil Treatment. G. Egloff and H. P. Benner, assrs. to Universal Oil Products Co. U.S.P. 1,535,653 of April 28, 1925 (Appl., Aug. 20, 1920).

Cracked oil is refined by distilling it, whilst in the presence of hydrochloric acid with finely divided earth. T. A. S.

363. Process for Treating Petroleum Oil. G. Egloff and H. P. Benner, assrs. to Universal Oil Products Co. U.S.P. 1,535,654 of April 28, 1925 (Appl., Sept. 18, 1920).

Emulsified oil is dehydrated by placing it in a still fitted with a closed coil and passing a freezing medium through the coil whereby the oil and water separate. After withdrawing the water heated gas is passed through the coil and the contents of the still brought up to cracking temperature under pressure. T. A. S.

364. Apparatus for Treating Oils. Gustav Egloff and Harry P. Benner, U.S.P. 1,535,655 of April, 1925.

The apparatus consists of furnace, heating coil, expansion chamber, dephlegmator and condenser, with the necessary pumps, gas separator and receivers.

The feature of the invention is the use of spirally corrugated heating tubes in the furnace, to give greater heating area and high velocity to the oil. R. P.

365. Process and Apparatus for Treating Hydrocarbons. William B. Howard. U.S.P. 1,535,724 and 1,535,725 of April, 1925.

The process consists of passing heavy oil continuously through a cracking still, then to an expansion chamber, and passing the vapours from the chamber to a reflux condenser. The uncondensed vapours flow to a final condenser and receiver while the condensed portion in the reflux condenser is forced under pressure to a secondary cracking still, and again the vapours generated are passed into the reflux condenser, thus continuously re-treating the condensate. A predetermined pressure is maintained in the first cracking zone and an increased temperature and pressure in the secondary zone. R. P.

366. Production of Petrol. Frank Tinker. U.S.P. 1,535,507 of April, 1925.

Preheated crude oil is mixed with superheated oil vapour in a mixing chamber; the product is passed to a separating chamber, where the heavy residue is removed and the vapours pass to a fractionating column. Condensate from the lower part of the column is withdrawn to a still and superheater for production of superheated vapour for admixture with crude oil, and the uncondensed vapour passes to a condenser. The heavy residue passes through a heat exchanger to preheat the incoming oil. R. P.

367. Apparatus for Converting Hydrocarbon Oils. Robert T. Pollock. U.S.P. 1,535,178 of April, 1925.

The apparatus consists of an inclined cylindrical expansion chamber, into which the cracked oils, from any type of cracking still, are discharged. The vapours and hot oil enter through the top of the chamber at the lower end. A vapour pipe and a residuum draw off cock are at the other end. The condensible gases and precipitated carbon accumulating in the chamber are of greatest depth at the oil inlet end. R. P.

368. Method for Treating Hydrocarbon Oils. Carbon. P. Dubbs. U.S.P. 1,534,927 of April, 1925.

Crude petroleum, or distillate or residue, when passed through the apparatus is more or less converted into lower boiling products. The process

consists of heating in coils while maintaining the oil under definitely controlled velocity and temperature, then passing the oil to an upright tank, thence into a settling chamber and back through the same heating coils. Either water or steam can be injected into the oil while undergoing treatment and any water condensed in the reflux condenser is automatically trapped and returned to or withdrawn from the system. Means are provided for holding a higher pressure on the oil in the heating tubes and a lower pressure on the upright and settling tanks. The boiling point of the oil is thus lowered and it is more or less converted into vapour. The excess carbon is precipitated out in the settling tank where the oil velocity is greatly reduced. The amount of heavy vapours, condensed and returned to the cracking coils, is controlled and the length of time that the oil is subjected to heat is also under control.

Fresh oil is continually supplied and heavy residual oil is continuously removed from the system. R. P.

369. Process of Making Gasoline from Crude Mineral Oil. Wilfred Fourness, assr. of two-thirds to S. Hazard Halsted, Ezra S. Gosney and Guy R. McComb. U.S.P. 1,526,907 of Feb. 17, 1925. (Appl., April 20, 1920).

Oil is pumped at 200 lb. pressure and 200° to 400° F. into a cracking chamber heated by a furnace to 600° to 1000° F. The vapours pass to a primary reaction chamber which is disposed vertically in a furnace and maintained at the same temperature as the cracking chamber. They then enter a cooling and tempering chamber at 200° to 400° F., whence they go to a secondary reaction chamber where they are again subjected to a temperature of 600° F. to 1000° F. They are then fractionally condensed.

C. V. H.

370. Refining of Cracked Gasoline. Benjamin T. Brooks. U.S.P. 1,528,398 of March, 1925.

The process consists of a preliminary treatment of pressure distillate or cracked gasoline with 10 per cent. caustic soda solution (5 to 10 per cent. by volume) for the purpose of removing sulphur compounds, followed by treatment with calcium hypochlorite solution made by absorbing chlorine in milk of lime, and containing 10 to 30 grams of Cl per litre. The amount of hypochlorite solution used will depend on the sulphur content of the oil and may vary from 0·2 to 2·0 lb. per barrel of gasoline. The time of treatment will vary with the nature and amount of sulphur compounds present.

After this treatment the product may still retain an objectionable yellow colour. The oil is dehydrated, for example, by gentle heating, and a trace of aluminium chloride, about 0·5 per cent. by weight, is added.

Thereafter, dry distillation yields a sweet water white distillate substantially free from sulphur compounds, and from objectionable colour. Other chlorides may be used for this purpose, such as zinc chloride. R. P.

371. Method and Apparatus for Cracking and Distilling Oils. Charles F. Richey and Paul Y. Duffee. U.S.P. 1,530,091.

In this combination of cracking and distillation apparatus the oil is cracked continuously in the liquid phase by passing through a coil contained in a furnace.

The hot cracked oil passes through coils within stills, and is cooled while under pressure by passing through a series of heat exchangers and finally a water cooler, to reduce the temperature to about 40° C., so that practically none of the condensable spirit escapes with the permanent gas.

An automatic valve reduces the pressure to normal and the fixed gases are allowed to leave the system and are used for heating.

The oil is returned to the heat exchangers, thence to the stills, where the heat of the cracked oil distils the spirit.

Superheated steam coils, open and closed, assist to regulate the temperature in the stills and sweeten the product. R. P.

372. Process and Apparatus for Refining Petroleum and its Distillates. John Hancock. U.S.P. 1,528,327 of March 3, 1925.

Oil is pumped under pressure and sprayed by a whirling nozzle into an emulsifying vessel where it is mixed with steam and caustic soda or other emulsifying agent. The emulsified mixture is carried into a specially designed cracking furnace, and passes through various coils, to raise its temperature to cracking point. The mixture then passes downward into a cooling coil contained in a water tank beneath the cracking furnace. From the cooling coils the oil travels to a dephlegmator where the light spirit is separated from the heavier constituents left in the oil. The heavy oil is sent back to the emulsifier for further treatment and the light products pass out of the system. The temperature of the emulsifier may be from 160° to 490° C. and the oil pressure from 40 to 60 lb. with steam pressure 75 to 100 lb. These figures may be altered to suit conditions of the various oils which may be used in the process. R. P.

Geological and Fields.

373. Relation Between Isocarbs and Oil and Gas Production in Kentucky. William L. Russell. *Econ. Geol.* **20**, 249, May, 1925.

This is a study of the relationship between the regional alteration of coals, as denoted by isocarbs, and the location of oil and gas pools in Kentucky. The special points that arose were :—

1. The wide difference between the proportions of fixed carbon in samples from adjacent spots.

2. The consistent disagreement of two sets of analyses of apparently equal authority.

The differing proportions of fixed carbon were found to be due partly to the presence of cannel coals whose fixed carbon content averages 10 per cent., and may be as much as 20 per cent., below that of accompanying bituminous coals. Isocarb maps prepared from cannel analyses are misleading. But the fixed carbon proportions of the bituminous coals themselves vary so widely that it is necessary to take district averages rather than individual analyses. On this basis the isocarbs agree remarkably well with known pools. Nearly all the good production comes from below the 60 per cent. isocarb, the gas-pools are mostly between the 60 per cent. and 62·5 per cent. lines, and the areas over 62·5 per cent. are barren. Where oil occurs in sandstone the proportion of gas to oil is high when the pool is in the 62·5 per cent. area. The fixed carbon content is found to be higher in anticlines than in synclines.

Study of the map shows that oil-pools in limestone tend to occur in areas of higher fixed-carbon content and at lower horizons than those in sandstone. Where alteration has reduced the porosity of sandstones, limestones are still open and oil-bearing. It is suggested that regional alteration may be less effective in destroying pools in limestone than in sandstone.

When isocarbs are favourable it does not follow that oil will be found. When they are unfavourable, however, oil is not to be expected.

On these grounds Pike County is not a hopeful area. The Eastern Coal Field may yield gas. Along the Rough Creek "Fault" conditions are unfavourable for sandstone pools, but deeper drilling into the Corniferous and Ordovician limestones may give results. The chances of finding oil in the Western Coal Field are fair. In a small area in the north-western corner of the State they are good.

The absence of water in certain sandstones may be correlated with a high fixed-carbon content, since Fuller has shown that lack of water is related to regional alteration. Thus, in the high fixed-carbon areas of Floyd and Pike counties, dry sandstones of low porosity occur.

Study of regional alteration shows that the conditions required by the hydraulic theory of oil accumulation are often not satisfied. Many of the important oil-sands of the Pennsylvania, New York and West Virginia fields become non-porous on at least one, and generally on both sides of the productive area, through the action of regional alteration.

W. G. W.

374. The Inorganic Origin of Petroleum in the Light of Volcanic Theories. E. Pyhälä. *Petroleum*, 1925, **21**, 975–981.

From a review of the various theories and observations of the last hundred and twenty years on the question of the activity of volcanoes and the causes of earthquakes the author draws the following conclusions. The interior of the earth has a very high temperature and contains compounds rich in energy, such as carbides, which, undergoing chemical changes, evolve heat. The occurrence of these chemical reactions is best explained by von Humboldt's theory of fissures. The reactions between infiltrated water and the ignited material in the earth's depths bring about an evolution of heat and occasional seismic movements. Petroleum may be formed by reactions with the carbides. The occurrence of volcanoes of elevation and laccoliths explains the formation of the most important oilfields. Hydrocarbon gases are evolved in volcanic eruptions, but are naturally completely oxidised. Petroleum is a by-product of volcanic processes. The evolution of heat and the formation of petroleum compounds may continue undiminished for an indefinite length of time in the future.

H. M.

375. The Chemical Nature of the Crude Oil of Gbely. R. Vondráček. *Petroleum*, 1925, **21**, 1035–1040.

The oil is reddish-green to transmitted light and dark green to reflected light. It has the following properties: Sp. gr., 0·9407; viscosity Engler at 50°, 2·98; closed fl. pt., 102° C.; solidification pt., −19·5° C. (liquid); hard asphaltum, none; soft asphaltum, 0·05 per cent.; paraffin wax, none; iodine value, 19·2; ash, 0·080 per cent.; carbon, 87·5 per cent.; hydrogen, 11·96 per cent.; nitrogen, 0·18 per cent.; sulphur, 0·12 per cent.; gross heat value, 10,600 cals. The analyses of samples taken in 1919 and 1921 differed little from these figures. The lightest fraction was colourless, the rest yellow to yellowish-brown. Sulphuric acid of 66° B. reacts with the crude oil with evolution of heat, but has little action on the lightest functions. The oil is very nearly akin to that of Louisiana. The following molecular wts. and formulæ were found for various fractions: Sp. gr. 0·865, 166 to 180, $C_{12}H_{22}$ or $C_{13}H_{24}$; sp. gr. 0·915, 246 to 260, $C_{18}H_{30}$ or $C_{19}H_{32}$; sp. gr. 0·935, 272 to 286, $C_{20}H_{32}$ or $C_{21}H_{34}$; sp. gr. 0·957, 366 to 380, $C_{27}H_{42}C_{28}H_{44}$; sp. gr. 0·969, 542, $C_{38}H_{64}$. The hydrocarbons of general formula C_nH_{2n-2} and C_nH_{2n-4} found in this oil are similar in composition to those obtained by the extraction of coal by pyridine. An attempt to fractionate the oil in the cold way by solution in phenol gave fractions as follows: Sp. gr. 1·008,

$C_{19}H_{30}$; sp. gr. 0·956, $C_{21}H_{34}$, and sp. gr. 0·922, $C_{23}H_{40}$, with, in each case, the fraction of an atom of oxygen. The mol. wts. of these three fractions were 316, 291 and 317 respectively. Gbely crude oil contains water which cannot be removed entirely by settling and is probably held up by the mud present in the oil, consisting of oxides of silicon, iron, aluminium and calcium, and probably organic colloids.

H. M.

Coal and Shale.

376. Improvements Relating to the Distillation of Bituminous Substances. Dr. Fritz Caspari. E.P. 223,878 of Sept., 1924.

This invention is designed to overcome the great difficulty of securing even transference of heat when distilling powderous coal, lignite, etc.

A vertical retort is used, which is fitted with a central high tension electrode. The powdered coal is admitted through a hopper at the top and drops into the retort, where the electric field leads it to the walls. In this way every particle of the coal dust comes into contact with the walls of the furnace and is thus exposed to a uniform temperature. In addition, the electric field accelerates the disintegration of the particles and so produces an increased yield.

The products are a rich high-grade gas, a crude tar and a half-coked residue which is removed at the bottom of the retort by the usual worm.

C. V. H.

377. Plate Condensers, Improvements in. Coke and Gas Ovens, Ltd. B.P. 230,540.

A number of circular plates are superimposed one above the other, each plate being formed with a circumferential flange projecting different distances on each side of its plane, thus forming a shallow tray on one side and a deep tray on the other. Thus the compartments are alternatively deep and shallow and arranged with deep compartments at the top and the bottom of the condenser. Flanged orifices are provided so that all the deep compartments are in communication and likewise the shallow ones. Cooling water flows from a bottom inlet through the shallow compartments to an outlet at the top, the vapours travelling similarly through the deep compartments to an outlet for the uncondensable gases. Each deep compartment is provided with another flanged orifice and a cup or basin for collection of the condensate, and a vertical passage giving access to the next lower deep compartment so that the condensate may flow into the basin. Vapour and condensate thus travel in the same direction through the compartments.

G. S.

378. Distilling Carbonaceous Materials, Apparatus for. C. A. Griffiths. B.P. 228,749.

A cylindrical hollow retort of small diameter is revolvably mounted between two stationary castings, the retort being as thin as possible and made of material of high heat conductivity. The stationary castings are used as inlet and outlet respectively. The material is fed in by means of a screw conveyer from a hopper, the spent material being discharged in a similar manner. The distillate is drawn off through a pipe at the discharge end and its removal may be assisted by a suction fan. A metallic brush or brushes is so arranged in the retort to act as a cleaner or scraper to keep the wall of the retort clean, and to assist in keeping the material moving and in distributing the heat.

G. S.

Abstracts.

Arranged by W. H. Thomas, A.R.S.M.

Abstractors.—S. F. Birch, Ph.D., D.I.C., A.I.C., S. Bowman, F.I.C., R. W. L. Clarke, B.Sc., F.I.C., A. Williams-Gardner, B.Sc., J. E. Marshall-Hall, A.R.S.M., H. Moore, M.Sc., A.I.C., F.C.S., W. S. Norris, Ph.D., D.I.C., A.I.C., R. Pitkethly, G. Sell, T. A. Smith, B.Sc., F.I.C., W. H. Thomas, A.R.S.M., H. I. Waterman, Ph.D., W. G. Weeks, A.R.S.M.

General.

379. The Petrol Situation. Cull & Co.'s *Financial Review*, May, 1925.

From a total world's production of 47,000,000 tons of crude oil in 1912, the yield of petrol amounted to 4,700,000 tons, or 10 per cent. In 1924 the total world's production of crude oil was 135,000,000 tons, and the yield of petrol amounted to 37,300,000 tons, or 27½ per cent. In 1912 the total petrol production was derived from refinery 91 per cent., cracking 2 per cent., and natural gas 7 per cent., and in 1924 the percentages were 70, 21 and 9 respectively.

In 1912 the total number of motor vehicles in use was 1,400,000, the available petrol per vehicle per annum being 1,000 gallons. By 1924 the number of vehicles had increased to 20,500,000, and the petrol available per vehicle was reduced to 550 gallons.

The principle sources of petrol supplies are (*a*) straight refinery, (*b*) cracking and (*c*) natural gas stripping. Dealing with their cracking processes, it is stated that the yields of motor spirit are Dubbs, 40 per cent.; Cross, 65 per cent., and Fleming, 35 per cent. Under cracking processes is included the Bergius process for the production of oil from coal. From a ton of average slack 50 to 60 per cent. is converted to oil, of which 30 per cent. would pass as motor spirit.

It is estimated that modern practice should admit of a further 12 per cent. on the world's petroleum production being obtained as petrol, and assuming that the total production remains at about 140,000,000 tons per annum, the yield of motor spirit would be about: Straight run, 28,000,000 tons; Cracking, 25,000,000 tons, and Natural Gas Stripping, 3,500,000 tons, a total of 56,500,000 tons per annum. On a basis of 500 gallons per vehicle per annum, this would allow of an expansion of 13 million vehicles over the present total. G. S.

380. Use of Scattered Light in Determination of Distribution of Size of Particles in Emulsions. A. J. Stamm and T. Svedberg. *J. Amer. Chem. Soc.*, 1925, 47, 1582-1596.

A new method is developed for the determination of the distribution of the size of particles in emulsions, using scattered light. Emulsions of benzene with aqueous palmitic acid and its sodium, potassium and cæsium salts were studied. The scattering of light varies as the surface or square of the radius of the particles, showing that true reflection occurs. The ratio of the average

sizes of particles in dispersed systems whose diameters are at least two to three times the wave-length of light may be determined directly from the ratio of the slopes of the intensity-concentration curves. The mass-distribution curves agree very well with those calculated from microscopic measurements. Different alkali soaps do not shift the mass maxima, although microscopic measurements indicate an increase in the number of small particles in going from sodium to potassium to cæsium soaps. An increase in the benzene concentrations, with the amount of stabiliser constant, causes an exponential increase in the radius corresponding to the mass maxima. An increase in the benzene concentration, with the ratio of benzene to stabiliser constant, gives maxima corresponding to a larger size of particles. W. S. N.

381. Studies in Emulsions. W. Seifriz. *Journ. Phys. Chem.*, 1925, **29**, 738—749.

III. Double Reversal of Oil Emulsions Occasioned by the Same Electrolyte.—The very similar behaviour of emulsions of olive oil and petroleum oils on the addition of sodium or barium hydroxide (double reversal) is restricted, with olive oil, to emulsions stabilised with gelatose, with petroleum oils, to emulsions stabilised with casein. Olive oil emulsions, casein-stabilised, exhibit normal behaviour—*i.e.*, sodium hydroxide reverses them to oil-in-water emulsions, and then the addition of barium hydroxide or barium chloride causes a return to the water-in-oil system. Double reversal with the same electrolyte is the rule for olive oil emulsions stabilised with gelatose and treated with sodium or barium hydroxide, but not the corresponding chlorides; the hydroxyl ion is primarily responsible. Petroleum oil emulsions from distillates of specific gravity between 0·828 and 0·857 undergo double reversion with sodium or barium hydroxide, but also with thorium nitrate, not, however, with barium or sodium chloride. Hence, with petroleum emulsions, the hydroxyl ion cannot alone be responsible for the double reversal.

IV. Multiple Systems.—Multiple emulsion systems (examples are given, one of which was a quinquemultiple emulsion system), in which the globules of the dispersed phase are themselves emulsions, are obtainable only when one or other of the components is impure, or when the stabiliser is not the same throughout the system—the stabiliser is not, apparently, the same substance when stabilising water-in-oil as when stabilising oil-in-water.

V. The Stabilisation Membrane.—In fine stable oil-in-water or water-in-oil emulsions the interfacial film is not visible as a distinct, morphological structure, but becomes plainly visible as a distinct structure upon the addition of sufficient hydroxide. This membrane is formed by a process (precipitation or coagulation) which, if it does not progress too far, is reversible. Thus, when a water-in-oil emulsion, in which the membrane has been made visible, reverses to an oil-in-water system, the partly stiffened membrane disappears, and the oil drops in the product become perfectly spherical, showing the presence of liquid membranes comparable to surface tension films. The degree of visibility of the stiffened membrane may vary from the definite, morphological structure, through the surface tension membrane visible only because of refraction, to those cases where the oil and water are apparently miscible. In this, and the two preceding Parts (III. and IV.), photographic illustrations are employed. W. S. N.

382. Emulsifying Agents as an Inhibiting Factor in Oil Sprays. E. R. de Ong and H. Knight. *J. Econ. Entomol.*, 1925, **18**, 299-302.

As the insecticidal properties of refined lubricating petroleum oils appear to be dependent on the mechanical properties of the oil rather than any

toxic effect, it is probable that any oil sufficiently viscous to form a non-volatile film is effective. The presence of any substance that tends to prevent the formation or retention of this film therefore inhibits the action of the oil. For this reason a mechanical mixture of oil and water should be used to obtain the best insecticidal results. S. F. B.

383. TETRAETHYL LEAD. Alice Hamilton, Paul Reznikoff and Grace M. Burcham. *J. Am. Med. Assoc.*, 1925, **84**, 1481-1486.

In a period of thirteen months ending November 1st, 1924, 60-70 men engaged in the manufacture of lead tetraethyl were poisoned. Ten cases proved fatal. Since that date improvements in equipment and plant have been made, with the result that only two serious cases have been reported. Gasoline containing lead tetraethyl is a source of danger to men working with it, such as garage hands, etc., and as during its combustion in a motor engine, lead chloride, bromide and sulphate are formed, and pass out with the exhaust gases, it constitutes a danger to the public. S. F. B.

384. ALCOHOLS FROM PETROLEUM. *Petroleum Times*, 1925, **13**, 631.

Although the possibility of preparing alcohols industrially from olefines has existed for many years, only recently with the advent of large scale cracking have these substances been available in sufficient quantity. The production of the alcohols from the olefines is a simple process, involving absorption of the gases in concentrated sulphuric acid, followed by the decomposition of the alkyl sulphuric acids produced by means of steam. Industrially the process has reached such importance that methods for producing the necessary olefines from the heavy residual oils, which are used solely for fuels, have been elaborated. In this way it has been found possible to put industrial alcohols, such as ethyl, isopropyl, butyl and hexyl, on the market at such low rates as $9 a barrel. The alcohols are particularly useful for convertion into the solvents necessary for nitro-cellulose varnishes, which are coming into extensive use in the varnish and automobile industry. S. F. B.

385. THE CONDITION OF THE ASPHALTENES AND PETROLEUM RESINS IN PETROLEUM AND ITS PRODUCTS. A Sachanen. *Petroleum*, 1925, **21**, 1441-1443.

The asphaltenes were precipitated from various crude oils and petroleum products of Baku and Grozny. They were found to be nearly identical in sp. gr., iodine value and composition. Some paraffin wax is at the same time precipitated, and the asphaltenes are accompanied by petroleum resins. The treatment of a petroleum oil by heating to 300° to 350° C. for 12 to 24 hours and blowing with air has no influence on the composition or properties of the asphaltenes, though their quantity is increased from 13·7 per cent. to 30 per cent., and a small quantity converted into carbenes. From 30 per cent. to 40 per cent. of asphaltenes may be dissolved in such solvents as chloroform, benzene and carbon disulphide. By evaporation these solutions may be still further concentrated, the asphaltenes being soluble in all proportions. They are also soluble in melted petroleum resins and heavy lubricating oils. Asphaltenes swell when treated with any medium in which they are soluble, and are insoluble in all media in which they do not swell. They are easily converted into carbenes and carboids, which have the same composition and properties. The swelling of asphaltenes is an exothermic reaction, whilst the solution of paraffin waxes is endothermic. Soft asphalts are strongly dispersed colloidal solutions of asphaltenes in resins and heavy oils. The coagulation and precipitation of asphaltenes by light petroleum ether is almost quantitative. The coagulation is quite reversible, but their change into carbenes and carboids is irreversible. H. M.

386. Cement Lining for Condenser Boxes. G. Triplett. *Ref. and Nat. Gas. Mfr.*, 1925, 4, No. 5, 51.

Metal condenser boxes that have become so badly corroded that they are unserviceable may be reconditioned by lining them with a thin coat of concrete. The latter is applied over a 1½ × 3 in. mesh wire screen under pressure. The method proves simple in use and comparatively cheap.

S. F. B.

387. Boilovers Seldom Occur in Oil Tank Fires, Except Where Crude Oil Burns. H. H. Hall. *Nat. Petr. News*, XVII., 23, pp. 66-75. June 10, 1925.

In the event of a tank of oil catching fire, these conditions must exist if a boilover is to occur. (1) The oil must contain some water, but the presence of oil is not a proof that a boilover will occur. (2) Heat must be carried down into the oil in advance of the burning surface. Such heat causes the water to be converted to steam, forming bubbles in the oil, which expand and produce a foam and overtop the container. (3) The oil, or the sediment, must be of a viscous nature, as otherwise a foam would not be caused by the rising steam and a boilover would not occur.

With a refined oil these conditions are not present, but with the majority of crude and fuel oils there is a liability to boil over in the event of fire.

G. S.

388. Evaporation Loss from Storage Tanks Saved with Gas Balloons. Ward K. Halbert. *Nat. Petr. News*, XVII., 22, pp. 21–23. June 3, 1925.

A very considerable reduction of storage-tank losses caused by evaporation of oil during hot weather has been effected by the use of gas balloons. The balloons, which are of the Blimp type and constructed of material unaffected by oil vapours, are attached to the vent pipe from the tanks and catch the vapours given off during the hot part of the day, allowing these vapours to be drawn back into the tank when the temperature falls. The balloon is housed in a hangar just big enough to contain it when inflated, and is held in a special frame. On top of the balloon a steel framework is floated, the object of this being to supply sufficient pressure to keep the pressure inside the tank equal to that of the atmosphere. While the pressures inside and outside the tank are equal, there can be no leakage from the small openings in the tank which would otherwise allow the escape of vapours. G. S.

389. Effect of Tank Colours on Evaporation Losses of Crude Petroleum. L. Schmidt. *Oil Age*, 1925, 22, 1923.

A test conducted on four tanks painted black, red, grey and aluminium showed clearly the value of light-coloured paint for tanks containing gasoline or crude oils of high gasoline content. Moreover, the wearing qualities of the four paints did not seem to differ. The saving, with the light paint, was estimated at 200 barrels per year per 55,000-barrel tank. W. S. N.

390. Hot Oil Affects Tank Contraction and Expansion. *Ref. and Nat. Gas. Mfr.*, 4, 6, p. 36. June, 1925.

Distortion of tank plates due to unequal expansion caused by hot oil can be shown graphically. Taking the coefficient of expansion for soft steel tank plates as 0·0000061 per degree F., temperature of atmosphere and plates 80° F., and oil pumped in at 160° F., and omitting radiation effect for simplicity, the linear expansion on a 55,000-brl. tank (115 ft. diam.) is 2·115 inches uniformly divided around the circumference. Setting up a

vertical at any point in the circumference and assuming that force of expansion is concentrated on this vertical, polygons are set up.

With a tank 30 feet in height, one-third full of oil, expansion forces are set up to ten feet from bottom. The area of sheet in the bottom ring is 33·75 sq. ins., and in the next ring 30 sq. ins., a total of 63·75. Multiplying this by 50,000 (the average tensile strength in lbs. per sq. in.), we have 3,187,000 lbs. force exerted by the expanding steel. The third ring cannot resist these forces set up below, and the top ring tends to buckle, inwards or outwards, a serious effect if the former. The tank bottom also is affected, usually buckling upwards until the pressure of oil flattens it again. G. S.

391. An Improved Process of Agglomeration of Various Materials. I. S. A. Blackorovitch. E.P. 229358 (Feb. 23, 1925).

The purpose of the invention is to bind solid materials together—*e.g.*, sand, paper, cork, sawdust, metal particles, etc., so that these possess a cohesive strength and become useful for a variety of purposes.

The process is divided into three stages, comprising :—

1. Mixture with plaster of Paris.
2. The addition of gelatine solution.
3. The addition of a hardening agent.

10 to 15 per cent. of plaster of Paris is added to the material, and after mixing a solution of alum, bichromate of potash and formaldehyde added. To this is then added a 30 per cent. gelatine solution. The mixture is kneaded into the desired form and hardens to a solid mass which is non-hygrometric, not injured by frost and capable of being polished. S. B.

392. Improvements in Processes of Agglomerating Loose Materials. A. L. Stielman. E.P. 205,063. Feb. 18, 1925.

The purpose of the invention is the agglomeration of loose material such as blast furnace dust or phosphate rock into briquettes.

The finely divided material is mixed with an acid or a metallic salt which will react with the material to form a binding agent within the mass. Sulphuric acid or ferrous sulphate may be used for this purpose. After the addition the mixture is subjected to pressure, during which the above reactions are said to take place, heat being furnished by these reactions. In addition another binding agent may be added, which possesses gumming characteristics such as molasses, tar or pitch. The briquettes are pressed into any required form. S. B.

393. Electrical Dehydrator. R. E. Land, Assr. to Petroleum Rectifying Co. U.S.P. 1,543,928 of June 30th.

In a dehydrator there are combined a shell and a revoluble horizontal shaft within the shell, rotating flat plate electrodes being mounted on the shaft within the shell, so as to rotate with it. Stationary electrodes are disposed between the rotating electrodes, and there are means for impressing an electric potential between the stationary and the rotating electrodes. H. M.

394. Drier. L. R. Christie, Assr. to Duff Patent Co. U.S.P. 1,539,649. May 26, 1925. Appl. July 3, 1923.

The drier consists of a rotatable drum containing a single compartment at either end and a plurality of drying compartments extending longitudinally through the drum and connected at either end with the end compartments. The drying compartments are separated from each other by heat ducts extending transversely through the drum and opening through the outer shell of the latter. T. A. S.

395. Acid-resisting Alloy. A. W. Clement, assr. to W. H. Smith. U.S.P. 1,540,928. 9.6.25. Appl., 17.12.17.

The alloy consists of 15 per cent. chromium, more than 50 per cent. nickel, not more than 8 per cent. molybdenum, and the remainder iron. T. A. S.

396. Preparation of Medicinal Vaseline from Technical Vaseline and from "Masut" Containing Paraffin Wax. A. Demschenko and A. Voronov. *Neftjanoe i. Slanceva Ch sjajstvo*, 1924, 1, 116—119.

The technical vaseline or masut is dissolved in benzine, shaken with charcoal, preferably Zelinski's activated charcoal, decanted and then fractionated. The process, which is much cheaper than the older method of filtering the undiluted vaseline, may be further cheapened by employing alumina from North Caucasus instead of charcoal. S. F. B.

397. Continuous Process of Solidification of Liquid Hydrocarbons. H. Neven. U.S.P. 1,525,409.

Into a vessel capable of continuous agitation, and containing some of the previously prepared emulsion, a hydrocarbon such as petroleum, and glue (both previously warmed), are introduced in small quantities. The emulsion is drawn off from the bottom of the vessel at the same speed as that at which the components are introduced, and run into another similar vessel, where it is mixed with formaldehyde. The latter substance causes the emulsion to solidify. The solid so produced is useful as a fuel. S. F. B.

398. Preparation of Synthetic Petroleum by the Andry-Bourgeois and Olivier Process. E. Gontal. *Chaleur et Industrie*, Special Number, 90—96 (1924).

The process consists of the catalytic hydrogeneration of water gas at 230° C. under atmospheric pressure to produce methane, cracking of the methane in an electric furnace at 2000° to produce ethylene and hydrogen followed by hydrogenation of the ethylene catalytically at 150°—300° under a pressure of 0·5 atmospheres. The products obtained have a calorific value of 2850 cals. and the expenditure of heat necessary to produce them is 12,100 cals. Waste substances such as wood waste and coals having a higher ash content may be used. S. F. B.

399. Improvements in and Relating to the Production of Petroleum-like Hydrocarbons from Fatty Acids, Glycerides and Vegetable and Animal Oils. A. Mailhe. E.P. 218,278.

Artificial petroleum composed of light, medium and heavy oils, similar to those from natural petroleums, may be prepared by heating fatty acids, derived from glycerides by saponification, glycerides, vegetable or animal oils of all kinds, to between 350°—450° in the presence of a metallic chloride or chlorides, oxide or oxides, or a mixture of an oxide and a chloride capable of acting as dehydrating and polymerising agents. Suitable substances include fused zinc chloride, dry calcium, barium and strontium chlorides and their oxides, dry sodium, potassium, magnesium and tin chlorides. The lighter oils may be polymerised subsequently by means of fused zinc chloride. S. F. B.

400. Process of Manufacture of Absolute Alcohol. Ricard, Allenit and Cie. E.P. 217,172.

An improvement in the manufacture of absolute alcohol according to E.P. 211,454, consists in the addition of any petroleum oil which contains no products boiling below 80° C. and which boils within a range of a few degrees. S. F. B

401. Improved Manufacture of Emulsions of Asphalt or the Like. Bataafsche Petroleum Maatschappij. E.P. 224,196 of July 13.

Asphalt emulsions are prepared by the use of hydroxides or carbonates of the alkalies, earth alkalies, or ammonium, and may be used for surface treatment of roads, which may take place in rainy weather. A product is prepared by the air oxidation of paraffin wax at high temperatures, and added in very small quantity to the asphalt, facilitating the formation of an emulsion. The mixture of asphalt and oxidation products is preferably allowed to flow into thin heated lye. Protective colloids are added to make the emulsions proof against electrolytes. The emulsification may be carried out at a temperature above 100° C. under increased pressure. Natural asphalt, bitumen, artificially prepared products, pitch, etc., may be used as asphalt. H. M.

402. Bituminous Emulsions. L. W. Low. E.P. 221,380.

Emulsions of tars, pitch, or bitumen suitable for roads, waterproofing wood, and so on, may be prepared by mixing the tar, bitumen, or other material with a quantity of tar oils insufficient for solution, and stirring the mixture while hot into a completely saponified hot mixture of casein, caustic soda, water, and resin. The product may be diluted or coloured by aniline dyes or other colouring material. S. F. B.

403. Gasoline from Natural Gas. H. E. Thompson. U.S.P. 1,523,313.

Natural gas is treated with an adsorbent such as activated charcoal, to remove butane and higher hydrocarbons present. The hydrocarbons are then recovered from the adsorbent and rectified to obtain a liquid and a gaseous fraction containing only a small quantity of any individual hydrocarbon common to both. This hydrocarbon may be butane. In U.S. 1,523,314, a propane-free natural-gas gasoline containing 25 per cent. of butane but none of the more volatile hydrocarbons is specified. S. F. B.

404. Method of Blending Light Hydrocarbons. H. Cooney. U.S.P. 1,543,750 of June 30.

To obtain blended gasoline natural gas having a gasoline content is compressed first to a low stage of compression, then cooled sufficiently to produce a low compression condensate. The remaining gases and vapours then undergo a higher stage of compression and are cooled sufficiently to liquefy a second condensate, a portion of which, and the final gases after their pressure has been lowered, are passed in heat-conducting relation with a mixture of straight-run gasoline and at least a portion of the first condensate, any residual vapours being withdrawn into the gas-compression system. H. M.

405. Equilibrium Vaporisation of Gasoline. R. Stevenson and H. J. Stark. *Ind. Eng. Chem.*, 1925, **17**, 679-685.

The authors have shown that the molecular weights of hydrocarbon mixtures, similar to gasoline, can be determined by the cryoscopic method, using benzene as solvent. Corrections for the evaporation of benzene during the determination and also for supercooling must be made; it is then possible to obtain results to within 0·2 per cent. of the theoretical. Surface tension methods have confirmed the results of previous workers that the hydrocarbons have the same molecular weight in the gaseous as in the liquid phase, no association taking place. Fractional distillation of petrol always gives rise to a certain amount of cracking with the consequent formation of gums, colouring matters, and high boiling residues of high molecular weight. The process is therefore irreversible. A perfectly reversible process has now been devised in which the liquid is kept in contact with the vapour until equilibrium has been reached, then both phases are removed and analysed. The authors have designated the point at which complete vaporisation occurs

in this test, the "Deppé end-point," and suggest that this point should be accepted as the mark of the value of the gasoline used. It possesses the advantage that no chemical change can occur. Thus a gasoline, having a molecular weight of 107, was only just completely vaporised when the molecular weight of the vapour was 109 in the test. The same gasoline showed an Engler-end point of 206°, and a temperature of 193° was reached before 95 per cent. had distilled over. The dew-point of gasoline-air mixtures is shown to be a function of the Deppé end-point. S. F. B.

406. Process for Obtaining Light Oils and Gaseous Constituents from Distillation Products. Gelsenkirchener Bergwerks-Aktien-Gesellschaft and H. Hock. *Eng. Pat.* 216, 140

A process for the separation of the constituents of the gas from the low-temperature carbonisation of coal by compression and subsequent complete partial liquefaction by expansion in a contra-flow apparatus. The liquefaction of the gas may be followed by one or more separations of the gas, the light oils which separate at different stages of pressure being collected separately. W. S. N.

407. The Analysis of Gaseous Hydrocarbons with Special Reference to the Olefines. H. Tropsch and E. Dittrich. Brennstoffchemie 6, 169-177 (1925).

The authors give a description of a very simple analysis. The hydrocarbons are separated by means of condensation. The condensate obtained with liquid air is freed from the *methane* by the "Töpler" pump, so that there only remain the homologeous hydrocarbons and the olefines. This liquid mixture of hydrocarbons is evaporated, and the vapours are transported through a series of condensation vessels of definite but always lower temperatures. Thus it is possible to separate the different compounds by only one fractional condensation. The method is applicated on different technical gases, such as "gasol," "synthol gas," and "berginisation gas" obtained from the treatment of coals. A method is described for the determination of olefines by titration. The olefines first are treated with concentrated sulphuric acid and then oxidised to CO_2 and H_2O by a known amount of KIO_3 (and H_2SO_4), $2\ KIO_3 + H_2SO_4 \rightarrow K_2SO_4 + H_2O + I_2 + 5\ O$. The iodine is expelled by boiling. The remaining KIO_3 is titrated after the addition of KI and starch with sodiumthiosulphate. (Compare R. Strebinger and J. Streit. *Zeitschr. f. anal. Chemie* 64, 136 (1924.) 1 Gr. KIO_3 corresponds with 87, 2 cm^3 of "CH_2" (0° and 760 mm.)

408. A Critical Study of the Burrell Indicator for Combustible Gases in Air. J. H. Milligan. U.S.A. Bureau of Mines. Tech. Paper 357. Feb., 1925.

The Burrell indicator is generally employed to ascertain the proportion of methane present in mine air. It consists of a large reservoir connected by a narrow passage with a gauge glass, the whole forming a U-tube. In the upper part of the reservoir a platinum-wire "glower" or spiral is placed, and the top of the reservoir has a valve cup, through which mine air may be drawn into the apparatus. To make use of the apparatus it is filled three-fourths with distilled water, and by blowing into a rubber tube connected with the gauge glass the water is forced to the top of the reservoir. The water being allowed to recede, some 31 ccm. of mine air is drawn into the reservoir. The glower is ignited by an electric current and allowed to burn for about two minutes with a bright yellow light, observable through a window in the side of the reservoir. The current being then cut off, the whole apparatus is vigorously shaken for one minute, by which means the carbon dioxide resulting from the combustion of methane is dissolved in the water. The amount of methane present is then

read off on the gauge glass from the shrinkage of the volume of gas in the indicator. The instrument may be calibrated and used for the detection of other combustible gases if they are practically insoluble in water. The error of the instrument, when carefully used, is less than 0·1 per cent. on the methane present. The possible sources of error in the working of the instrument are discussed. A correction may be made for the slight error brought about by the rise in temperature of the water during combustion. H. M.

409. Apparatus for Preparing Vapour-air Mixtures of Constant Composition. W. P. Yant and F. E. Frey. *Ind. Eng. Chem.*, 1925, 17, 692.

An apparatus is described for supplying the liquid to be vaporised (*e.g.*, benzine, kerosene, motor benzol, etc.) at a constant rate to a steady stream of air. The air, maintained at a steady pressure by means of the usual pressure regulator, passes through a flowmeter into an electrically-warmed chamber. The liquid is fed into this chamber by means of a wick, made from gauze, and is supplied to it from a bulb through a capillary tube. The bulb itself is attached to one limb of a U-tube, the bottom of which contains mercury, the liquid being forced out of the bulb by allowing water to drip into the open limb of the U-tube at a constant rate. A special form of reservoir to maintain the constant pressure of water is described. S. F. B.

410. Gases, Improved Apparatus for Treating. Edouard Urbain, Brit. Pat. 228,094. (Conv. France, Jan 26, 1924.)

This is a patent of addition to No. 218,974 which claimed a process for the selective absorption of gases by active carbonaceous material packed in or around tubes. In order to reduce the heat consumption to a minimum the weight of the apparatus is reduced in the present improvement. To bring this about, the need for reinforcing the cover and base is obviated by extending the delivery pipe through the absorption chamber to act as a bracing member between the cover and the base. G. S.

411. Water Gas from Solid Fuel, Apparatus for Production of. J. Rude. Brit. Pat. 235,007.

Steam is admitted at various levels and points of the retort, and the inlets are so arranged that the steam can be introduced intermittently at various levels. The water gas and undecomposed steam are withdrawn from various levels and led away. G. S.

412. Improvements in Apparatus for Cleaning and Cooling Producer Gas. E.P. 235,987. July 2, 1925. C. W. Thorne and Ferolite Ltd.

The patent rights cover the use of an apparatus for cooling and cleaning producer gas generated on motor cars and similar vehicles. The producer gas is passed over a number of transversely disposed sheet metal baffles which form a zig-zag course; the gas then traverses an annular passage formed by an outer casing fitted with angularly disposed baffles to obstruct the course of the gas. The outlet from this outer vessel is separated from the induction pipe of the engine by a filter containing a plurality of gauze sheets of graduated sizes. A. W.-G.

413. Method of and Apparatus for Separating Mixed Gases. D. Low. E.P. Lovejoy and T. J. Case. U.S.P. 1,546,632 of July 21.

The apparatus comprises an electro-magnet having poles with non-parallel adjacent faces to form between them a magnetic field of varying intensity, a closure for the space between the poles forming an unobstructed passage-way, and means for passing mixed gases through this passage-way and for separately removing the gases from the more intense and less intense portions of the field. H. M.

414. Paraldehyde as Combustible and Motor Fuel. E. Baslini. *Atti Congresso Naz. Chim. Ind.*, 1924, 240—241.

Paraldehyde may be used in motor fuels as a substitute for alcohol; it is best mixed with 40—60 per cent. benzine, in which case perfect combustion (without residue) and uniform explosions are obtained. It is advisable to add traces of substances to inhibit oxidation. W. S. N.

415. Pintsch Oil. H. J. Finlay. *Trans. Proc. New Zealand Inst.*, 1924, 55, 444—447.

Pintsch oil, obtained by compressing Pintsch gas, contains at least 50 per cent. benzol and 25 per cent. toluene. The low-boiling fraction (60°—90° C.) contains normal amylene, hexylene, acetylenes, butadiene and butylene. No satisfactory method was found for commercially utilising the oil, either by fractional distillation, separation of the benzol by cooling, or treatment to reduce unsaturation. W. S. N.

416. The Valuation of Motor Fuels by the Aid of an Index Number. W. Ostwald. *Petroleum*, 1925, 21, 1323—1328.

The author proposes that the average boiling-point of distillation shall be used for the valuation of motor fuels, excepting fuels containing alcohol. He asserts that the average boiling-point of a mixture may be calculated by the simple rule of mixtures from the average boiling-points of its constituents and their proportions, and that the performance of a motor fuel in the engine is closely indicated by the average boiling-point. To find the average boiling-point the temperature at which 5 per cent. distils over is taken, and the corresponding temperatures for each 10 per cent. additional up to 95 per cent. are taken, avoiding the initial and final points, as being indeterminate. Fuels having an average of 110° C. are regarded as highly valuable fuels, those of 120° C. valuable, and those of 130° C. fuels of low value. The author suggests that the value of a motor spirit is in direct proportion to these figures. H. M.

417. Alcohol Motor Fuel from Molasses. II. Use of Alcohol and Alcohol-Ether Mixtures as Motor Fuels. E. C. Freeland and W. G. Harry. *Ind. Eng. Chem.*, 1925, 17, 717—720.

Road tests in motor cars run on alcohol, alcohol-petrol and alcohol-ether are described. In order to use these mixtures successfully in cars designed for gasoline or kerosine, certain adjustments must be made and certain precautions taken. Thus alcohol, or alcohol containing petrol which allows the engine to be started from cold more easily, gives as good results as petrol with careful manipulation of the air supply. There is less flexibility at low speeds, and although the thermal efficiencies are equal the alcohol consumption is 50 per cent. higher. In tractors this falls to 33 per cent. above the petrol consumption. Ether aids in decreasing the consumption and also gives greater flexibility. The addition of 0·75 per cent. of pyridine or aniline to the alcohol prevents corrosion of the cylinders by the acid products formed, and 1 per cent. of added cylinder oil aids considerably in the lubrication. S. F. B.

418.—The Italian Motor Fuel of Siesti. Gino Panebianco. *Atti Congresso nas. Chim. ind.*, 1924, 236-237.

The motor fuel patented by Siesti has been found to contain roughly 80 per cent. of alcohol and 20 per cent. carbon disulphide, but as these two substances are not completely miscible in these proportions, it is probable that its preparation involves some chemical combination between its constituents. Unlike ethyl alcohol-benzine fuels, absolute alcohol is not necessary for its

preparation, and the addition of water does not cause separation into two layers. It differs from other sulphur containing fuels, in that the products of combination have no corrosive action on metal. S. F. B.

419. "Anti-Knock" Fuel Direct from Crude Oil. *Petroleum Times*, 1925, 14, 260.

"Stellarene," the anti-knock value of which is about half that of benzol, is produced as follows:—The gasoline (paraffinoid), about 30 per cent., is taken off the crude in a Foster pipe still. The residue passes through a second pipe still, in which it is run down to a marketable fuel oil (10 to 15 per cent. on the crude). The vapour from the second still, superheated to about 1050°F., passes into a catalytic chamber, a simple shell tank, heavily insulated, either vertical or horizontal, packed with a catalyst, the nature of which is not stated. The vapours, after a few seconds in the catalytic chamber, pass to a heat exchanger, thence to a tile-packed dephlegmator, from which the overhead gives 70 to 80 per cent. stellarene. The condensate from the dephlegmator is recycled through the cracking system. The vapours from the dephlegmator are condensed and redistilled, in shell-fired still, in the presence of a second catalyst (nature not stated). W. S. N.

420. Experiments on the Transformation of Vegetable Oils and Animal Fats to Light Fuels. Beniamino Melis. *Atti Congresso nas. Chim. Ind.*, 1924, 238-24.

In order to convert vegetable oils and animal fats into petroleum like hydrocarbons the author has resorted to a method involving saponification and decomposition by means of potassium, hydroxide, and lime. The oil to be treated is heated with potassium hydroxide, lime and water in the correct proportions for the equation:—$2C_{17}H_{35}COOK + Ca(OH)_2 = K_2CO_3 + CaCO_3 + 2C_{17}H_{36}$, a slight excess of the alkali hydroxide being used. After the saponification is complete the residue is distilled. In this way there were obtained transparent yellowish brown liquids having a green fluorescence, an odour of petroleum and an average density of 0.800; they are soluble in benzine, ether and chloroform. The distillate obtained from castor oil differed from the others, in that it was almost colourless, possessed a bluish fluorescence and an aromatic odour, boiled in the neighbourhood of 17°, and was soluble in alcohol as well as ether. On redistillation it gave a product resembling the distillate from the other oils and fats. All these hydrocarbons obtained were unsaturated, and absorbed bromine rapidly. When redistilled, all gave low fractions boiling from 70° upwards, which contained volatile inflammable hydrocarbons, and left a thick residue at 250°. The latter possessed a tar-like odour and a taste resembling that of petroleum products. The distillates from castor oil always contained a higher proportion of aromatic hydrocarbons than those from other oils, probably derived from the ricinoleic acid; the aromatics in the other oils are, no doubt, formed through the glycerine giving rise to cyclic compounds. The lower boiling fractions are miscible with alcohol, and can be used for motor fuels; the high boiling residues are readily hydrogenated by the Bergius process. The transformation is considered in connection with the theory of the origin of petroleum. S. F. B.

421. Liquid Fuel Mixtures. General Motors Research Corporation. E.P., 114,102.

In order to lessen the fluxing action of the products from the combustion of lead tetraethyl, or similar tetrasubstituted lead derivatives, on the porcelain and metal parts of the engine, certain halogen containing derivatives are also added to the fuel. Suitable halogen, containing substances, include carbon tetrachloride amyl, hexyl, or ethyl chlorides, chlorinated aromatic

hydrocarbons, chloral hydrate or alcoholate, and dichlopropane. The fuel, which may consist of gasoline, kerosene, or any similar hydrocarbon, may contain benzene or alcohol. S. F. B.

422. Motor Fuel. J. F. P. de la Riboisiere. U.S. 1,539,722.

In order to promote combustion and ignition, ·5—2 per cent. ether is added to gasoline, or other hydrocarbon fuel boiling below 160°, phenyl sulphide, or some other phenylic material, to the extent of ·3—·5 per cent., also being added to act as blending agent. Benzyl diselenide, triphenyl thallane, benzylamines, etc., may also be used. S. F. B.

423. Motor Fuel from Hydrocarbon Oils. G. F. Forword and J. G. Taplay. U.S. 1,541,697.

Kerosene, creosote oil or other material boiling above 140° C. to be treated is atomised into a retort where it meets a current of steam supplied to the retort from the opposite direction. The mixture of steam and oil is then passed over porous charcoal at a temperature varying from 550°—950° depending on the material being treated. S. F. B.

424. Fuel Oil Combustion. W. F. Ravenor. U.S.P. 1,542,171. 16.6.25. Appl., 22.4.24.

Unvaporised oil particles in the flame from an oil burner are projected on to the surface of a liquid boiling at a higher temperature than that of the flame. The surface of the liquid may be covered with a powdered catalytic agent. T. A. S.

425. Liquid Hydrocarbon Fuel. A. N. Kerr. Am. Pat. 1,545,261.

A cut is taken from natural gas gasoline having an initial boiling point not lower than about 10° F., a final boiling point not higher than about 150° F., a gravity of 94°—120° Baumé, and a vapour tension of 15—20 lbs. at 70° F. This fuel, which preferably consists of 50—75 per cent. butane, 50—25 per cent. pentane, is stored, for example, in an underground tank (to avoid variations of temperature), the liquid being withdrawn, as required, from the bottom. W. S. N.

426. Improvements in Liquid Fuels. A. A. F. M. Seigle. Eng. Pat. 216,150.

Heavy hydrocarbon oils are vaporised and the vapour caused to ascend a vertical retort which is packed with metallic chips or turnings, and in which intimate contact between the metal and the vapour is ensured. The issuing vapour is then condensed in two stages, at each stage being caused to expand into a wide vessel, the temperature of which is controlled by means of water boiling under a pressure of, respectively, 10—12 kilograms per sq cm., and 3 kilograms per sq. cm. Uncondensed vapour from the second cooler passes to an ordinary worm condenser; the condensed liquid is returned to the first cooler, whilst the condensed liquid from the first cooler is returned to the original still. W. S. N.

427. Combustion in the Gasoline Engine. Evidence for the Existence of the Water-gas Equilibrium. C. C. Minter. Ind. Eng. Chem., 1925, 17, 687—690.

Determination of the carbon dioxide : hydrogen ratio made on the exhaust gases from a petrol engine running under very varied conditions show that the carbon dioxide content varies inversely with the hydrogen content. From this it follows that the water-gas equilibrium which is found in the inner cone of the Bunsen flame, also exists in the petrol engine. S. F. B.

428. Pyrometry of Exhaust Temperatures of Internal Combustion Engines. C. E. Foster. *Paper read before Diesel Engine Users' Assc.*, May 22, 1925.

To ensure the economical working of Diesel engines it is desirable frequently to ascertain the temperature of exhaust gases from each cylinder separately, and so to detect the rise in load which accompanies incipient breakdown in any cylinder. For this purpose the electric pyrometer of the type in which a thermo-electric couple generates a current which is the actual means of measurement is most suitable. The very feeble current generated is measured by a millivolt-meter. To minimise the effect of casual heating of the indicator and other parts of the circuit on the resistance, a so-called "ballast" resistance, relatively large, is introduced into the circuit. It is customary to calibrate the instrument while the cold junction is at a temperature of 0° C., but a device by which the indicator automatically shows the difference in temperature between that of the hot junction and 0° C., whatever the temperature of the cold junction, has been adopted for convenience. A compensating extension prolonged up to the indicator enables the latter to be placed at a convenient distance. The two elements of the thermocouple were formerly enclosed in a tube, but now the tube itself is made to do duty as one element, and more rapid readings are obtained by this arrangement. The indicator consists of a coil carrying the current and capable of movement in the field of a permanent magnet. The coil was formerly suspended by a filament, but now is mounted in a delicate bearing in which pivots come in contact with jewels, this being less disturbed by the vibration. The turning moment in a stout coil is greater than in a fine coil. H. M.

429. Some Notes on the Working of the Ruston Mechanical Injection Oil Engine. C. O. Milton. *Paper read before Diesel Engine Users' Assc.*, July 9, 1925.

The engine reported on is a high-compression mechanical-injection cold starting engine installed at Maidenhead. It is of the four-cycle vertical open A-frame type with four cylinders, and is rated 380 b.h.p. at 250 r.p.m. The bore is 16 in. and the stroke 22 in., the compression pressure 425 lbs., and maximum pressure at full load 590 lbs. The mean effective pressure at rated power is 85 lbs. per sq. in. Starting from cold is easily effected in cold weather with a pressure of 180 lbs. of air in starting vessel. The mechanical injection runs with perfect steadiness from no load to full load. The exhaust is scarcely visible at half load, and quite unobjectionable at full load, being slightly brown. With an annual running plant load factor of 50 per cent. this engine would show an advantage in fuel consumption over the Diesel. Running on B.P. Diesel fuel oil the consumption was ·614 lb. per kw. hr. at full load, and for the whole time, ·698 lb. The lubricating oil consumption for the first year was high but has been cut down to ·12 gall. per engine-hr. run. The liners are cooler than in Diesel engines. It is important to keep the cooling water spaces in the cylinder covers free from scale, which may cause cracked cylinder covers. The fuel pump cams of cast iron have been substituted by steel ones. H. M.

430. Report on Heavy-oil Engine Working Costs (1923-24). Submitted to Diesel Engine Users' Assoc. Nov. 14, 1924.

The characteristics of the working costs are very similar to those for 1922—23. Figures from 34 installations are available. The average service time is 2,060 hours, and average plant load factor 13·3, and cost per unit generated ·899d., against ·967d. for last year recorded. The over-all thermal efficiency, taking the gross calorific value of the fuel at 19,500 B.Th.U., is over 23 per cent., the average fuel oil consumption ·748 per unit, and the average consumption of lubricating oil per unit, ·00195 gall. Great interest is at present being taken in methods of lubricating oil recovery. Full

details are not to hand as regards cost of repairs and maintenance, but it is known to average about £1 per kilowatt installed, under the conditions indicated above. A comparison is made of the cost of Diesel and steam pumping plants in action at the Alexandria Water Company's installation. The maintenance charges are 9 per cent. for the Diesel plant and 2½ per cent. for the steam plant, of the total cost of running. The total cost per million foot-tons of work done was £7 for the steam plant and £2 17s. 3d. for the Diesel plant. The average fuel consumption of the Diesel plant amounted to ·45 lbs. per B.H.P. hour. H. M.

431. The Significance of Exhaust Temperature. P. H. Smith. Paper read before Diesel Engine Users' Assoc. Oct. 3, 1924.

When the high-speed semi-enclosed type of Diesel engine was first manufactured in large sizes the performances of these engines were found to be less satisfactory than those of the standard type. A 3-cylinder 600×600 mm. 215 r.p.m. set, being rated at 650 B.H.P., was found to be only capable of developing 300 k.w. as a safe load, with a consumption of 0·53 lbs. per B.H.P. and a dirty exhaust. The design of combustion space and flame plate was altered so that the fuel should pass through the centre of gravity of combustion space and the stream impinge approximately normally to the piston. It was found that there was a straight line law connecting exhaust temperature and mean indicated pressure. The modification in combustion space design resulted in the exhaust temperature being reduced from 765 to 665° F. By raising the blast pressure 100—150 lbs. per sq. in. above the smoking point the exhaust temperature was reduced from 697° F. to 652—663° F. An alteration in the flame plate reduced the exhaust temperature from 720° to 610° F. As a result of these changes the fuel consumption was reduced to 0·454 per B.H.P. on full load. Rather lower exhaust temperatures were obtained when using tar oil fuel. The systematic use of the pyrometer to check exhaust temperatures is of utility. H. M.

432. Submarine Engines and High Speed Heavy-oil Engine Electric Generating Sets. P. A. Holliday. Paper read before Diesel Engine Users' Assoc. Feb. 13, 1925.

The paper deals with the progress made in the construction of high-speed Diesel engines, particularly for submarine use, in Germany, and in particular the 4-cycle engine designed by the M. A. N. Company. While during the war the design of such engines in this country generally followed the 100 B.H.P. per unit type, the Germans designed 10-cylinder engines of 3,000 B.H.P. and 6-cylinder engines of the same unit design were in use. The 4-stroke 6-cylinder M. A. N. type is easily adapted for land use, in which case its rating is reduced from 1,750 to 1,075 B.H.P. The mean effective pressure is very high, *i.e.*, 88·8 lbs. per sq. in., or 75·5 lbs. on the reduced rating, and the B.H.P. per sq. in. piston area is ·525 on the reduced rating, against about ·43 in English-built 4-strokes. The employment of such engines greatly increases the generating capacity of power stations for space occupied. A piston speed of 955 ft. per min. is employed on lower rating. The consumption of fuel per sq. in. of piston area is about ·357 lbs., or ·256 lbs. on reduced rating, a considerable advance on English practice. The steel castings employed for crank-case, cylinder jackets and cylinder heads are exceptionally fine, being thin and light in weight. No through bolts are used, the stresses being taken up by the castings. A special cooling arrangement for the combustion plate is adopted, and twin fuel valves facilitate central cooling. The pistons have oil-cooled crowns. The fuel valves are of the direct-lift type. Multi-hole flame plates are employed on the M. A. N. engines; a single hole on that of Körting. The exhaust valves and boxes are water-cooled. Numerous drawings show the construction of cylinder, piston, and valves, etc. The air-compressors are 4-stage when designed to form a part of the ship's high-pressure system at 2,400 lbs. per

sq. in., but in other cases 3-stage. Forced lubrication is everywhere adopted. Such engines are now rendering excellent service in several generating stations. H. M.

432. Recent Oil Engine Developments. J. L. Chaloner. Paper read before Diesel Engine Users' Assoc. Feb. 17, 1925.

In reviewing the oil engines at present marketed in this country, as exemplified by the exhibits at the Wembley Exhibition of 1924, the author classifies them according to the compression pressures employed, as low pressure (up to 150 lbs.), medium (from 150 to 300 lbs.) and high pressure (above 300 lbs.), and by the mode of injection, as, gas, air, or mechanical. The tendency to employ lower grades of oil causes the question of combustion to increase in difficulty, and various devices are resorted to to cope with this difficulty. A tendency towards simplicity of design is shown in the increasing use of the 2-stroke cycle, especally for the larger powers, and of mechanical injection, while the double-acting principle makes progress, being favoured by considerations of initial weight and cost. The high-pressure marine types are now constructed in aggregates ranging up to 8,000 H.P., while the land high-pressure types run up to 1,000 and 1,500 H.P. The application of the heavy-oil engine in other fields is exemplified by the construction of an aero-engine of 600 H.P., running at 1,300 r.p.m., with a weight of only 3 lbs. per B.H.P. Though speeds of 2,500 r.p.m. have been realised and maintained, the use of heavy-oil engines for automobile propulsion has as yet made no progress, nor has their application to locomotives, though this presents a promising field. Great progress has been shown in the marine types, most of the large engines of this type being of original continental design. Interesting descriptions and drawings are given of 11 makes of marine engines, and of various industrial types.
H. M.

434. Value of Liquid Fuels in Internal Combustion Engines. P. Dumanois. Compt. rend., 1925, 181. 26-28.

Measurements of the full consumption of a motor engine over long distances have been made. The results obtained for four fuels are as follows:—

		Max. speed attainable.
Methyl alcohol	22·0 litres/100 km. ..	80 km./hr.
Petrol 50: ethyl alcohol 50 ..	11·6 litres/100 km. ..	85 km./hr.
Petrol 80: kerosene (containing 0·2% lead tetraethyl) 20 ..	12·7 litres/100 km. ..	93 km./hr.
Petrol 70: kerosene (containing 0·2% lead tetraethyl) 30 ..	11·7 litres/100 km. ..	90 km./hr.

The addition of 5 per cent. water to the pure methyl alcohol prevents the back-firing which frequently occurs with the pure alcohol alone.
S. F. B.

435. Improved Means of Operating Internal Combustion Engines. J. Y. Johnson. (Communicated from Badische Anilin und Soda fabrik.) E.P., 215, 776, 8.5.24.

Synthetic methanol prepared from carbon-monoxide or carbondioxide contains iron carbonyl to the extent of 5 to 200 milligrammes per gallon. It is an excellent motor fuel. T. A. S.

436. Improvements in Methods of Preparing Fuels for use in Internal Combustion Engines Operating with Viscous or Refractory Fuels. H. Junkers. E.P., 220,291, of July 23rd.

A lighter readily combustible auxiliary fuel is prepared by cracking a proportion of the heavier working fuel by the waste heat of the engine, as by a still built into the exhaust pipe. The engine can be started easily from

cold on the auxiliary fuel, after which it may be run on the main fuel, or the auxiliary fuel may be used for effecting pre-combustion in the cylinder during the whole running of the engine. H. M.

437. Separating Liquids of Different Specific Gravities. Improved apparatus for C. F. Higgins. Brit. Pat., 234,875.

Liquids of different specific gravities, such as water contaminated with oil, are separated by flotation through a series of compartments in which they flow alternately in an upward and downward direction. G. S.

438. Apparatus for Automatically Mixing Liquids in Flow in Predetermined Proportions. B. W. Davies, P. A. G. Bell, and J. E. Edmondson. Brit Pat. 236,775.

Water passes from a pipe-line into a receiver, whence it passes through a duplex water pump and exhausts into the throat of a venturi tube placed in the pipe-line. The pistons of the water pump operate the plungers of two other pumps, which draw a chemical solution from a tank and deliver it under pressure to the mouth or throat of the venturi tube. G. S.

439. Apparatus for Controlling the Flow or Pressure of Fluids. O. F. Walker. Brit. Pat. 236,730.

Gas flows into a valve and through a hollow valve stem into a hollow float in a chamber containing liquid. The gas displaces some of the liquid from the float, which raises the valve and allows the gas unrestricted flow into the top of the float chamber, and by an outlet to the consuming device, as the pressure inside and outside the float equalises the float sinks and closes the valve. G. S.

440. Temperature Regulating Devices. T. E. Beacham. Brit. Pat. 236,716.

A closed vessel, placed within the chamber within which the heat is to be regulated, is filled with liquid from which vapour is generated by heat, such liquid operating to displace another liquid in a vessel outside the heated chamber. A float or piston in the outside vessel is adapted to regulate the supply of the heating medium. G. S.

441. Measuring and Registering Apparatus for Viscid Liquids. Sauser A.G., assrs. of H. Wydler. Brit. Pat. 227,833. Conv. (Switzerland), 15.1.24.

A rotary pump, which acts as a measuring device, is housed in a protective casing and connected to an inlet and outlet. The disc-like piston of the pump is mounted eccentrically and at each revolution introduces two measured volumes of liquid to the valve box over the outlet, each revolution registering one unit on a counter at the front of the instrument. G. S.

442. Valves for Controlling the Passage of Fluids at High Temperatures. T. W. Graham and W. H. Buckley. Brit. Pat. 237,152.

The tongue of the valve is supplied with cooling water through the stem of the valve, which is divided to allow of the passage of the inlet and outlet water. The valve seat and guide are supplied with cooling water by means of cast-in tubes or other means. G. S.

443. Apparatus for Delivering Measured Quantities by Volume of Liquid. A. Neilson and A. E. Watson. Brit. Pat. 236,655.

By placing an operating handle to hang vertically compressed air is admitted to the storage receptacle forcing the liquid to be measured into the measuring vessel. The passage of the liquid into the measuring vessel raises a displacer which stops when the requisite amount has been admitted, automatically cutting off the supply of compressed air to the tank. The operating handle is then raised to the horizontal position and the measured

quantity of liquid delivered to its receptacle. In the event of the receptacle being unable to hold all the liquid, the operating handle is brought to an upright position and the excess in the measuring vessel returned to the tank. G. S.

446. Instrument for Measuring the Flow of Liquids. J. Zoller and R. Schuster. Brit. Pat. 236,139.

A pipe leading from a storage receptacle is provided with a restricted portion, and on either side of this are led vertical tubes connected at their upper ends by a tube. The pipe has two downward enlargements into which the tubes project and one tube is provided with an enlargement at about the level of the liquid in the tank. The rate of flow of the liquid is read from a scale on the vertical tube. G. S.

445. Apparatus for Indicating the Level of a Liquid at a Distance. H. Farman, assr. to Société H. et M. Farman. Brit. Pat. 226,610. Conv. (France), 29.12.23.

A closed tube, having openings in its lower end, is fixed in the tank to be measured. A pump is connected to the lower end of this tube by a conduit and a manometer is similarly connected to the upper end. To obtain the level of the liquid, air is forced into the tube by means of the pump, expelling the liquid from the tube, and the pressure of the air then registers on the manometer. G. S.

446. Mechanical Filtering Device. E. F. Spanner. Brit. Pat. 233,738.

The fluid to be filtered is fed into a drum having a wall of gauze, such drum being contained in a tank. The drum rotates and the gauze is exposed to a jet of gaseous medium under pressure in such a way that the oily material clinging to it is blown into a hopper located within the drum and delivered externally of the device. The liquid in the tank is maintained at a constant level. G. S.

447. Means for Automatically Controlling the Temperature of Furnaces. J. L. L. Verney. Brit. Pat. 218,303 (Conv., France, 28.6.23).

Furnace temperature is maintained at a determined value so that the value is varied according to a predetermined law of temperature variation. The controlling apparatus consists of a bar movable lengthwise and sliding on a support which moves uniformly in a transverse direction to the bar. The support, on which the curve of the law of variation is materialised, is moved by mechanism which is so controlled as to drive in either direction as a point on the bar passes to either side of the curve. G. S.

448. Raising Crude Oil from Tanks. Method of E. Cortés. Brit. Pat. 235,002.

An endless belt conveyor dips into the oil in the tank, the oil being removed from the belt being scraped off by the pressure of a tray edge. From the tray the oil passes to a pipe by which it is conducted away. G. S.

449. Pouring Device for Petrol or Other Tins. J. Tabberner. Brit. Pat. 234,993.

A spout with an external flange is provided with a nut or screw to engage on the pouring device on the tin and secure the spout by the flange. When not in use the spout is housed within the tin, suitable means being provided for closing the orifice. An internal gauze strainer may be inserted in the device. G. S.

450. Oil Drums and the Like, Improvements in. P. G. Cox. Brit. Pat. 234,755.

Drums in which the outlet is located near the base are provided with a rotatable disc with an aperature which can be made to register with the

outlet from the drum. The disc is provided with a funnel-shaped projection which acts as a means of directing the flow of liquid. The outer face of the disc and funnel attachment is normally, *i.e.*, when the aperture is closed, flush with the outer surface of the drum, obviating risk of damage. The tightness of the disc is adjustable by a nut which is provided with a suitable locking device to prevent its being loosened by rotation. G. S.

451. The Determination of Sulphur in Petroleum and its Portions. B. W. Tiutiunnikov. *Chem. Zentr.*, 1924, II., 264.

A thick fusible glass tube (0·8×20 cms.) is sealed at one end and into it is put successively a layer of magnesium powder 2 cm. deep, 1—1·5 gms. of the petroleum to be analysed, and 8—10 cc. of magnesium powder and strips. The open end of the tube is then closed with a narrow tube dipping under mercury. The tube is then heated commencing at the uppermost layer of magnesium until all the oil has been decomposed. The sulphur in the oil reacts to form magnesium sulphide. This is then decomposed by dilute sulphuric acid, the hydrogen sulphide evolved absorbed in caustic soda, oxidised by means of bromine and the sulphur estimated as barium sulphate. Results using thiophene show that the method gives slightly low results. S. F. B.

452. A Special Vacuum Distillation Flask. R. L. Shriner. *Ind. Eng. Chem.*, 1925, 17, 589.

The flask is blown from Pyrex glass and has a capacity of 2 kg. Ground glass joints are used for thermometer support and air-tube and in the neck of the flask are a number of indentations which give the necessary surface for fractionation effect. The side arm is also inset so that no return liquid can get into the condenser. Distillations up to 400° C. have been carried out under a pressure of 5 mm. without any sign of the flask collapsing. S. B.

453. Improved Method and Apparatus for Determining the Calorific Value of Gases. J. I. Dorgelo. E.P. 222,839. 28.5.25.

The calorific value is automatically registered at equal intervals by passing measure volumes of gas for combustion through the calorimeter having a constant water equivalent. A cylinder for the measurement of the gas and a syphoning device are partly immersed in a one liquid containing vessel. The gas flame, after automatic ignition, passes under the calorimeter under the action of the pressure which forces the gas from the measuring cylinder to the burner. The liquid which is syphoned out after the combustion has finished, flows through the calorimeter. The pyrometer only comes into operation when the flame is under the calorimeter, the indicating device going back to zero after each combustion. S. B.

454. Detection of Small Quantities of Petroleum Vapour With the Burrell Methane Indicator. G. W. Jones and W. P. Yant. *Bur. Mines, Tech. Paper*, 1924, 352.

The method is based on the relative ease with which petroleum vapours explode and will indicate to within 0·1 per cent. of the amount present. The Burrell methane indicator is described and illustrated. The vapours escaping from petroleum in storage range from ethane to duodecane, but hydrocarbons above heptane are never present in sufficient amount to produce explosive mixtures even at 49° C. S. F. B.

455. Determination of Unsaturated Hydrocarbons in Petroleum. G. Gane, P. Schwartz and M. Zlisteanu. *Bul. Soc. Chem. Române.* 1924, 6, 71—79.

Comparison of the Mills, Hawes, Hübl and Wijs methods has shown that although it cannot be used as an absolute criterion of the amount of unsaturated hydrocarbons present in petroleum, the Wijs method is the most

satisfactory. By means of it, useful comparative results may be obtained as well as indications of the nature of the products and of the unsaturated hydrocarbons present. S. F. B.

456. An Improved Electrically Heated Melting Point Apparatus. F. A. Mason. *J. Soc. Chem. Ind.*, 1925, 44, 577.

The apparatus is designed to overcome those difficulties met with in dealing with substances of high M.P. 200—400° C. A metal cylinder of copper or brass 2 in. high ¾ in. diameter is wound with suitable resistance wire and supported vertically. Two holes are drilled into the cylinder to contain the thermometer and specimen tube respectively, and a third hole is drilled at right angles to these, *i.e.*, horizontally through the block and used for observing the material under test by means of a source of illumination placed behind. By including a variable resistance the rate and degree of heating can be controlled as desired, the behaviour of the substance being under observation throughout the test. S. B.

457. Determination of Gum-forming Material in Gasoline. M. B. Cooke. *Pet. Times*, 1925, 13, 973.

Evaporation of the sample from an open dish over a steam bath is shown to give erroneous results due partly to the oxidising effect of the air and partly to loss by creeping. The author has devised an oven heated by steam in which the samples (20 c.c. in a 30 c.c. dish) is placed. Steam is allowed to blow through this, thus evaporating in the presence of an inert atmosphere. Two or three hours is required for this operation, the dishes being then transferred to an ordinary oven and heated to 105° C. to constant weight. If the gum content is high, *i.e.*, above 40 mgs. per 100 c.c., it is advisable to dilute the sample with gum-free spirit because there is some danger of oxidation in the final drying oven. The method has been found to give much more consistent results than those obtained by open evaporation. S. B.

458. Desulphurisation of Crude Oil Distillates with Silica-gel. H. I. Waterman and J. N. J. Perquin. Brennstoffchemie 6, 255-257 (1925); compare, too, Chemisch Weekblad 22, 378 (1925).

The silica-gel used in these experiments was prepared by the methods described in the Bulletins of the Davison Cy. From the results obtained the following tables can be mentioned: Borneo-kerosene Sp.Gr. 0,857, boiling point: 150°-250°, and containing no sulphur; at each treatment the kerosene with different quantities of the mentioned sulphur compounds was shaken for several hours:—

Name of the sulphur-compound.	Volume of the solution in c.M.³	Quantity of the gel used at each treatment.	No. of treatments.	% S. Before treatment.	% S. After treatment.	Desulphurisation in per-cents.	
$(C_2H_5)_2S$	100	25	1	2·83	1·91	33	Decolorised completely
C_2H_5SH	150	25	2	0·93	0·64	31	
C_2H_5-rhodanid	125	20	2	0·46	0·06	88	Almost completely decolorised.
C_2H_5-rhodanid	135	25	2	0·59	0·02	97	
$C_2H_5N=C=S$	125	25	2	0·465	0·39	17	
$(C_2H_5)_2SO_3$	150	25	2	0·465	0	100	
$(C_2H_5)_2SO_3$	150	25	2	0·05	0	100	

With a Persian distillate desulphurisation was more than 20 per cent. (used quantity of gel 28+26=54 per cent. calculated on the oil), with a Mexican

distillate (117 per cent. gel calculated on oil 60—70 per cent., with another Mexican distillate 50 per cent. (114 per cent. gel calculated on oil).
H. I. W.

459. Purification of Hydrocarbons with Sulphur Dioxide. L. Edeleanu and W. Hess. U.S.P., 1,526,665.

In the treatment of hydrocarbons, such as petroleum oils with liquid sulphur dioxide, the oil is extracted in batches at a temperature below the boiling point of the sulphur dioxide under the pressure at which the operation is carried out in such a manner that the mother liquor from a previous extraction is used to extract fresh material. The treatment is finished with pure sulphur dioxide. S. F. B.

460. Purification of Mineral Oils. A. E. Dunstan. U.S. Pat. 1,549,469.

Petroleum distillates containing gasoline and kerosene are treated with an aqueous solution containing hypochlorous acid (slight chlorination is no objection). The oil is now redistilled, either with or without a preliminary soda-wash, to give a substantially pure gasoline distillate; the kerosene residue is now purified by treatment with bauxite or some other absorbent medium. W. S. N.

461. Refining Petroleum Oils for the Manufacture of Lamp Oils. R. W. Hanna and J. F. Brooks. U.S. Pat. 15,48,992.

The oil is preheated to 200° F. and forced, together with sulphuric acid (acid containing 15 per cent. SO_3 is preferred), into jacketed washers, in which the reaction mixture is maintained for 30 to 60 seconds at a temperature of approximately 215° F.; the reaction products are then immediately cooled. It is claimed that preheating the oil reduces the time necessary for useful reaction, and thus reduces the amount of decomposition of the reaction products; with less decomposition, less dilution of the acid occurs, and acid economy is thus effected. Such decomposition is also partly arrested by the rapid cooling subsequent to the washing process. W. S. N.

462. Process for Decolorising and Stabilising Oils. P. W. Prutzman. U.S. Pat. 1,547,682.

Hydrocarbon oils are purified and partly decolorised by treatment with an absorbent material at an elevated temperature, i.e., above 350° F. (e.g., 600° F.), in an apparatus the free space of which is kept air-free by a stream of an inert gas. After steaming the hot mixture to eliminate decomposition products, the oil and the absorbent are separated by mechanical means. W. S. N.

463. Gasoline-purifying Composition. T. Le Vord. U.S. 1,523,547.

Gasoline used in cleaning fabrics, etc., may be freed from dirt and grease by filtration through a composition containing caustic soda 70 parts, sodium sulphate 17·5 parts, sodium carbonate 4 parts, sodium chloride 1·5 parts, and a little water. S. F. B.

Refining

464. Treating Hydrocarbon Oil. S. B. Coblentz. 1,540,929. 9.6.25. Appl. 31.12.20.

After treatment with acid and separation of the sludge, oil is emulsified with a salt solution and the emulsion subjected to cataphoretic action. T. A. S.

465. Treating Colloidal Clay. E. C. Bierce. U.S.P. 1,544,210.

In order to produce a filtering and decolorising material from colloidal clay, the lumps of clay from the quarry are dehydrated until the moisture content reaches 12 per cent., mineral acid (about 4 per cent.) is then added and the water content then further reduced to 5 per cent. The clay is then broken up to pass a coarse mesh sieve treated with a further 1 per cent. of acid and then screened to separate the finer particles (suitable for the process of contact filtration) from the coarser particles which are better suited for percolation. S. F. B.

466. Recovery of Spent Plumbite (from Oil Refining). A. Kinsel. U.S.P. 525,301.

The black precipitate (lead sulphide) produced in the "doctor" process for refining oils is treated with acid sludge, also produced in the refining process, and the lead sulphate obtained treated with strong caustic soda to regenerate the sodium plumbite. S. F. B.

467. Process for Purifying Oil. E. Eichwald. U.S.P. 1,550,523. 18.8.25. Appl. 2.6.23.

A substance containing furfurol is added to hydrocarbon oils. Separation into two layers takes place, the furfurol layer containing the aromatic bodies which are thus separated. T. A. S.

468. Treating Crude Petroleum with Molasses. W. H. Kane. U.S. 1,523,219.

Crude petroleum is mixed with molasses and heated without distillation to separate the water. The molasses and substances mixed with them are removed before distillation. S. F. B.

469. Process for De-emulsifying Liquids. C. V. Zoul. U.S.P. 1,547,712.

An emulsion, preheated if necessary, is filtered through a filter press in which a layer of de-emulsifying agent has previously been deposited by rapid filtration under low pressure; the filtrate is then separated by any of the usual means. The de-emulsifying agent is prepared by mixing wood pulp (or similar material), or wood waste (etc.), or slag wool, or diatomaceous earth, or similar fibrous absorbent material with one of the constituents of the emulsion to be separated, preferably that constituent which constitutes the continuous phase of the emulsion. In case this constituent is of an oily nature it is preferably substantially dried, and may also, if necessary, be heated somewhat before mixing with the fibrous absorbent. It is sometimes of advantage to mix a further quantity of the solid absorbent to the emulsion previous to filtration. Provision is made for conducting the whole operation in an enclosed apparatus to avoid loss when dealing with emulsions containing a volatile constituent. W. S. N.

470. Improvements in or Relating to Bituminous Emulsions. H. A. Mackay. E.P. 236,641.

Aqueous bituminous emulsions may be produced by mixing together molten or liquid bituminous material with a small proportion of an emulsifying agent, about 2—10 per cent., and adding hot water, or a hot dilute alkaline solution, or both. Suitable emulsifying agents comprise sulphonated fatty oils or mixtures of sulphonated fatty oil such as sulphonated cod oil, sulphonated castor oil or alizarine oil. The sulphonated oil may be partly replaced by a fatty acid or any other known emulsifier, *e.g.*, casein. S. F. B.

471. Oil Mixture for Use in Treating Petroleum-Oil Material. H. Behm. U.S.P. 1,541,242.

The author uses liquid compositions for treating oils, such as kerosene, which consist of a mineral oil together with the reaction products of (1) lime and rosin, formaldehyde, ammonia and turpentine, (2) lime, rosin, formal-

dehyde and ammonia, (3) lime, rosin, formaldehyde and ammonia, alcohol, acetone and tincture of iodine, (4) lime, rosin, formaldehyde and ammonia, alcohol, acetone, tincture of iodine, chlorinated lime and turpentine. Kerosene, or other mineral oil material, after treatment with the above, is added to gasoline for use as a motor fuel. W. S. N.

472. Method of Producing Decomposed Oil Material. H. Behm. U.S.P. 1,541,243.

The author decomposes hydrocarbon oil (*e.g.*, kerosene) by the use of mixtures of all or some of the following:—Slaked lime, rosin, alcohol, ammonia, formaldehyde, iodine, orange peel, chlorinated lime, and turpentine. Heat is sometimes applied; the product is blended with motor fuels. W. S. N.

473. Treatment of Diatomaceous Earth. F. W. Golby. E.P. 234,735.

The diatomaceous earth is reduced to a fine state of subdivision and calcined at a temperature between 1200° and 2500° F., preferably 1800° F. S. F. B.

474. Activating Carbonaceous Material. O. L. Barnebey and M. B. Cheney. U.S. 1,541,099.

The granular charcoal or other material to be activated is heated in thin layers, without agitation, and superheated steam or other activating gases passed over it. Subsequently the hot activating gases are replaced by cooler gases, which are then further heated for use in activation. S. F. B.

475. Distillation of Petroleum Oil in Apparatus With a Relatively Large Heating Surface. D. Wandycz, S. Suknarowski and Chmura. *Przemysl Chem.*, 1924, **8**, 201—222.

The authors have distilled the residual oil, remaining after the removal of gasoline and kerosene, in a current of superheated gasoline vapour. The residual oil was allowed to flow down a column up which the superheated gasoline vapour was passed. The non-volatile residue was collected at the bottom and retreated, while the volatile portion was carried away with the gasoline vapour. By partial cooling, the less volatile constituents were separated from the gasoline vapour, but in order to recover the rest of the products the whole of the gasoline was condensed and fractionated. The products obtained were brighter in colour than those obtained by the usual method of distillation and proved easier to refine. They compare favourably with the corresponding substance isolated by distillation in a high vacuum. S. F. B.

476. Rectifying Column Calculation. (With Particular Reference to N. Component Mixtures.) E. V. Murphree. *Ind. Eng. Chem.*, 1925, **17**, 747—750.

Conceptions based on the ideal column do not offer a suitable basis for calculation when the mixture being fractionated contains more than two components. Even certain calculations for binary mixtures are unsatisfactory. The author has elaborated from the absorption equations a method of calculation, applicable to actual plates, which can be employed for mixtures of any number of components. A means of expressing the efficiencies of rectification of the volatile components is given. S. F. B.

477. Improvements in Condensing Apparatus Especially Adapted for Refining Oil. C. H. Leach. E.P. 211,882 of July 21.

The apparatus is provided with a series of banks of condenser tubes and partitions for forming vapour passes about the tubes. The lower ends of the tubes are surrounded by separate condensing basins formed in a supporting head. The cooling liquid is directed through the interior of the tubes

and its path of flow may be varied. Two or more different cooling liquids may be employed, but first the charging oil is preferably employed, thus becoming preheated. A cover plate co-operates with the lower portion of the head to direct the flow of cooling medium through the tubes, and a different form of cover may be used to vary the flow. The condensates may be separately withdrawn from the condensate pockets in the head. Water or air may be used as a cooling medium for the vapours in the coolest portion of the condenser. The apparatus is particularly adapted to be employed with groups of four continuously operating stills, and the oil vapour may enter at 300° F. from the coldest still and at 650° F. from the hottest still. The charge oil may enter at 90° F. and be discharged into the first still nearly at the vapourising temperature. The heated cooling water may be utilised about the plant. H. M.

478. The Distillation of Sulphur Containing Oils. D. W. Sissingh, Brennstoffchemie 6, 22 (1925).

Generally the percentage of sulphur in the distillates of a crude oil will be higher when the specific gravity is higher. The decomposition which occurs during the distillation can cause the sulphur content of the heavier fractions and of the residue to be lower than that of some distillates of lower sp gr. The sulphur compounds of the Panuco oil are less decomposed. The losses of sulphur during the distillation with superheated steam in the distillation method of Bormann-Kubierschky and in the cracking process of Burton, therefore, are but small. Even in the last process the quantity of expelled sulphur is small, here, much sulphur is left in the coke-residue. The author says that these facts obtained with Panuco oil are not in agreement with the idea of Redwood that a simple desulphurisation method might be found in the process of distillation. For other oils which contain easy decomposible sulphur compounds the idea of Redwood may be right. H. I. W.

479. Continuous Distillation Still. H. Rufli. U.S. Pat. 1,547,690.

An apparatus consisting of a plurality of vertical stills or retorts in series, provision being made for bringing each succeeding compartment to a higher temperature than the preceding one. W. S. N.

480. Distillation Apparatus. R. M. Kelly. U.S.P. 1,541,227.

In the manufacture of mixed distillates from benzol the vapours need not necessarily pass through a dephlegmator. Means are provided by which the vapours are by-passed round the dephlegmator when mixed distillates are being made, and allowed to pass through the dephlegmator when pure products are required. G. S.

481. Process of Distillation. H. F. Perkins. U.S.P. 1,541,274.

Fractions of oils to be distilled are vaporised and the vapours are passed through a metallic packing maintained at a temperature above the end-point of the cut to be made. The vapours then pass through another similar device in which the temperature is within 6° F. of the end-point, and are finally condensed. G. S.

482. Heat Exchanging and Distilling Apparatus. H. Bollmann. Brit. Pat. 233,964. (Conv. Germany, 12.6.24.)

The liquid to be treated passes through a series of stages alternately provided with heat-exchanging tubes, the intermediate steps being made up of means (such as Raschig rings) by which the liquid is spread over a large surface. The vapours pass out through outlets in the intermediate stages. G. S.

483. Oil Heater. J. Primrose, Assr. to Power Speciality Co. U.S.P. 1,542,089.

A form of pipe still in which the oil first passes through a horizontal layer of pipes which form the roof of the furnace and encased in firebrick blocks. The oil then passes through a series of banks of tubes provided with a cast-iron corrugated surface to the final outlet where the vapours are taken off. The ends of the tubes are not corrugated but are provided with a rectangular plate which acts as a support for the tube, so that any tube can be easily removed. The portion of pipe extending through this plate are joined by return headers, and this portion is of greater length than normally required in order to permit of the header being cut off if necessary and still leave sufficient pipe for expansion into a new header. G. S.

484. Oil Heater. J. Primrose, Assr. to Power Speciality Co. U.S.P. 1,542,090.

The furnace is divided into two chambers by a bridge wall, the hot gases from the furnace chamber passing over the bridge to the heating chamber. The oil to be heated passes through a bank of tubes in the heating chamber, then through tubes in the rear wall of the chamber, through tubes extending across the roof of the furnace, and finally through tubes extending over the front wall of the furnace, and leaves the apparatus by a header and manifold connecting with the last series of tubes. All tubes directly exposed to flames or radial heat are protected against burning out. G. S.

485. Retort Settings, Improvements Relating to. H. J. Toogood and R. Dempster and Sons, Ltd. Brit. Pat. 234,947.

To provide for expansion which takes place in the refractory material used in retort settings, the joints between the rows of bricks in the combustion chamber arch and the stay wall are of refractory material and proportional in thickness in relation to the size of the bricks. Spaces, arranged transversely, are left between the ends of bricks in the stay wall, and the portion of the wall surrounding the retort is built solid. The bricks at the edges of the stay wall are staggered, so that certain bricks only come in contact with the pier walls. G. S.

486. The Presence of a Sulphur Compound in Some Grades of Commercial Benzene which Contain no Thiophene. E Parisi. Ann. chem. applicata, 1925, 15, 121-123.

The sulphur in certain thiophen-free grades of commercial benzene has been traced to the presence of diphenyl sulphone. This is probably formed by the action of sulphuric used in refining, the phenyl sulphuric acid first formed breaking down on redistillation or reacting with a further molecule of benzene. S. F. B.

487. The Recovery of the Aromatic Hydrocarbons of the Petroleum Fractions. N. Dafiaila and N. Popa. *Chem. Zeitung*, 1925, 98 II., 252.

Products consisting of aromatic hydrocarbons alone cannot be obtained from the petroleum fractions either by extraction by sulphur dioxide or by pyrogenetic distillation. As a direct recovery of the aromatic hydrocarbons as they exist in the fractions, attempts were made to produce s-trinitrotoluol (trotyl) from a fraction, 93° C. to 125° C., of Arbanasi crude, and a benzine extract of Bustenari crude obtained by sulphur-dioxide treatment. The production from the petroleum fraction was more advantageous than from the extract, as in the first case 9 per cent. and in the second case 23·4 per cent. more nitric acid was required than when pure toluol was treated. The crude product contained trinitroxylol and required twice crystallising from alcohol for its complete purification. The yield was 86 per cent. of the raw product. A purer product might probably be obtained if the limits of

the fraction were narrower. The un-nitrated residue consists almost entirely of saturated hydrocarbons, of which 5 per cent. to 6 per cent. by volume was destroyed during nitration. H. M.

488. Behaviour of Oil and Oleic Acid with Water. IV.-VI. J. F. Carrière. *Rec. Trav. Chem.*, 1925, **44**, 121-129.

The behaviour of a pure oil in water has been compared with that of an oil containing a trace of oleic acid in water. From the results obtained it has been shown that most of the anomalies in the behaviour of the oil in water, attributed by some authors to partial hydrolysis of the oil, are due to impurities. Traces of fatty acids in oil may be detected by noticing the effect of ammonia vapour after equilibrium between the oil and water has been established. S. F. B.

489. Naphthenic Acids Derived from Nishiyama Petroleum. Y. Tanaka and S. Nagai. *J. Am. C. S.*, 1925, **47**, 2369—2371.

The crude naphthenic acids were obtained by acidifying the waste lye produced in the refining of a "neutral oil" distillate from Echigo-Nishiyama crude oil. Examination showed that they contained 20 per cent. water and 57·6 per cent. of organic acids; the acid value was 143·5. They were purified by shaking with 1½ volumes of petroleum ether containing a small amount of alcohol, removing the solvent from the extract and distilling the residue at 9 mm. The acids obtained were converted into their potassium soaps, extracted with petroleum ether to remove neutral substances, and the acids regenerated by acidifying. The partially purified acids possessed a slight odour and had: d_4^{15} 0·9768, n_D^{15} 1·4770, and an acid value of 249·7. Further purification was effected by converting the acids into their methyl esters (pale yellow liquid with fruity odour having d_4^{15} 0·9449 and n_D^{15} 1·4651 1·4762, cent. boiling between 130°—180°/8·9—9 mm.) and saponifying these, the acids being recovered by acidification. The mixture of pure acids formed a light yellow viscous oil possessing the following properties: d_4^{15} 0·9741, n_D^{15} 1·4762, and value 248; 80 per cent. distilled between 170°—210° (8·9—9 mm.). 4500 gms. of the mixed methyl esters were fractionated, and after 25 systematic fracionations, four main fractions were obtained. These proved to be the methyl esters of dodeca-, trideca-, tetradeca- and pentadeca-naphthenic acids. All were colourless liquids having a fruitlike odour. (The chief properties of the esters are given.) By means of alcoholic potash they were converted into the potassium salts, the acids being obtained by acidification, followed by extraction with low boiling petroleum ether (b.p. 40°), and removal of this solvent, the final traces being expelled by warming to 70° in a vacuum. The corresponding acids were all colourless and odourless liquids having no iodine number, and possessing the following properties:—

	$C_{12}H_{22}O_2$	$C_{13}H_{24}O_2$	$C_{14}H_{26}O_2$	$C_{15}H_{28}O_2$
d_4^{15}	0·9712	0·9736	0·9762	0·9776
n_D^{15}	1·46977	1·4727	1·4759	1·4784
Neutr. value	279·4	267·3	248·6	232·
B.p.	168°—170°	177°—179°	186°—188°	194°—196°

The specific gravities of these acids being lower than the corresponding acids of Akita-Kurokawa origin, it is inferred that they are isomers. The importance of the presence of these isomers in determining the origin of the petroleum is indicated. S. F. B.

490. The Action of Aluminiumchloride on Heptanaphthene. N. D. Zelinsky and W. A. Smirnow. *Brennstoffchemie*, 6, 249—255 (1925).

The authors studied the decomposition of methyl*cyclo*hexane by $AlCl_3$ under pressure of the gases formed by this decomposition. They worked at different temperatures and without the addition of HCL-gas. The heptanaphthene was prepared from a Baku-crude oil. Boiling-point 101°—102°

(740 m.M.); sp. gr. 15°: 0,7695. Even at ordinary temperature the decomposition of the hydrocarbon is very important. No unsaturated gaseous hydrocarbons were formed. The heating of heptanaphtene with $AlCl_3$ in closed glass tubes gives large quantities of *iso*butane and high boiling products. The hydrocarbons obtained which boil at 300° and higher, at ordinary pressure, can be distilled without any decomposition. H. I. W.

491. Action of Aluminium Chloride on Hexahydrobenzene and Saturated Aliphatic Hydrocarbons. R. K. Stratford. *Matières Grasses*, 1925, 17, 7114—7116.

An account of the methods employed to prepare the cyclic hydrocarbons necessary for the research. *Cyclo*hexane and methyl*cyclo*hexane were prepared from benzene and toluene by catalytic hydrogenation using nickel as catalyst. The yields and optimum temperatures for the reduction were 80—90 per cent. at 160°—165° and 60—70 per cent. at 140°—155° respectively. In order to reduce benzene derivatives having a long side chain platinum black must be used as catalyst. The reduction is carried out in glacial acetic acid solution in a vessel communicating with the hydrogen reservoir, and the platinum is added in the form of oxide, prepared from specially purified platinum chloride. It rapidly becomes reduced to the metal and heat is evolved. The catalyst prepared in this manner has under the most favourable conditions an activity lasting for 8—10 days, but it is necessary to reactivate the platinum by an oxygen treatment as recommended by Willstätter after the third day. It is particularly sensitive and is easily affected by impurities such as those found in the air of the laboratory. The most favourable temperature for the reduction was found to be in the neighbourhood of 30°. This catalyst has been successfully used to hydrogenate ethyl-, *n*-propyl-, *iso*propyl-, *sec*butyl-, tertiary butyl-, *n*-amyl-, *iso*amyl- and diethyl-benzene, but great care is necessary in preparing the substance for reduction to ensure that no bromine is present, as this substance rapidly destroys the catalytic properties of the platinum.

S. F. B.

492. Methanol and Synthol from Carbonmonoxide and their Use as Motor Spirit. Franz Fischer. *Brennstoffchemie*, 6, 233 (1925).

Franz Fischer gives some technical results about the use of "methanol." He used a car with a 4 cylinder-engine of 12 H.P., and determined the consumed fuel pro 100 kilometers:—Methanol: 22 liter; gasolene with 20 per cent. of kerosene: 12·7 liter; gasolene with 30 per cent. of kerosene: 11·7 liter; "carburant national" (gasolene: methalnol 1:1): 11·6 liter. The consumption of fuel pro 100 K.M. is almost two times higher in the experiment with methanol compared with gasolene (+kerosene). Notwithstanding this the used number of B.T.U. is lower with methanol. Fischer thinks that within a few years the price of methanol and of synthol will be much lowered. H. I. W.

493. Relative Rates of Catalytic Hydrogenation of Different Types of Unsaturated Compounds. I. Aliphatic Ethylenic Derivatives. S. V. Lebeder, G. G. Kobliansky, and A. O. Yakubchik. *J. Chem. Soc.*, 1925, 127, 418—440.

The authors find that the rate of absorption of hydrogen by an unsaturated ethylenic compound in the presence of platinum black is a linear function of the time. The rate is determined by the number of substituents and is greatest for a monosubstituted compound, but declines as the number of substituents increases. In substances having two ethylenic linkages there are two well-defined rates of absorption. Mono-, tri- and tetra-substituted compounds absorb hydrogen at a uniform speed throughout the reaction, but di-substituted derivatives only do so during the first part of the

action. Mixtures of similarly substituted compounds hydrogenate concurrently, but dissimilarly substituted derivatives are reduced consecutively. Should the substances present be substituted to a different degree they are successively hydrogenated. Mixtures of di- and tri-substituted derivatives exhibit either a lower or a higher rate of absorption than when either substance is reduced alone, with the result that the two rates tend to converge. The degree of substitution may be determined by comparing its own specific rate of absorption with the rate when the substance is mixed with another typical compound. S. F. B.

494 MUTUAL SOLUBILITIES OF HEXADECENE AND LIQUID SULPHUR DIOXIDE. W. F. Seyer and J. L. Hugget. Trans. Roy, Soc. Canada, 1924, [iii.], 18, III., 213-216.

The critical solution temperature is approximately 42·7° C. Hexadecene has freezing-point 3·5° C.; this is lowered to −2·2° C. in the presence of sulphur dioxide. Under ordinary conditions diolefines are soluble and monoolefines insoluble in liquid sulphur dioxide, a difference of which advantage may be taken in refining mineral lubricating oils. W. S. N.

495. MUTUAL SOLUBILITY OF SULPHUR DIOXIDE AND NORMAL HEXANE. W. F. Seyer and A. F. Gll. Trans. Roy, Soc. Canada, 1924, [iii.], 18, III., 209-211.

The two liquids are completely miscible above 10·1° C.; *n*-Hexane has freezing-point −93·7° C.; sulphur dioxide has freezing-point −72·8° C. The freezing-points of each, in the presence of the other, become, respectively, −96° C. and −73·5° C. The solubility curve resembles that for sulphur dioxide-*cyclo*hexane. In the region of −10° C. the solubilities of normal hexane and *cyclo*hexane are but slightly different; if this is typical of their respective types, the separation of naphthenes from paraffins by means of liquid sulphur dioxide does not appear possible. W. S. N.

496. PYROGENIC DISSOCIATION OF HEXADECANE. H. Gault and F. A. Hessel. IV. INFLUENCE OF FURNACE LENGTH AND OF TEMPERATURE, AT CONSTANT RATE OF FLOW. Les Matières Grasses, 1925, No. 205, p. 7169-7174.

Using previously described methods, the authors have studied the influence of furnace length and of temperature on the thermal decomposition of hexadecane at constant rate of flow. Gaseous and liquid products are considered separately. (*a*) *Gaseous products:* Rate of flow: 1 c.c. per min. Temperatures from 470° to 815° with "64" furnace; from 615° to 815° with "16," "32," and "48" furnaces. (i) The yield of gas increases with increasing temperature and increasing furnace length. (ii.) The proportion of unsaturated hydrocarbons increases with rise of temperature to about 540°, and then decreases; it is greater the shorter the furnace. (iii.) The proportion of hydrogen increases with temperature and with furnace-length. (iv.) The proportion of saturated hydrocarbon decreases with increasing temperature to about 615°, and then increases; it is greater, the longer the furnace. (*b*) *Liquid products:* Temperatures from 590° to 815°. (i.) The recovered liquid decreases with rise of temperature, slowly up to 540° with furnaces "32," "48," and "64," up to 615°, with furnace "16," then more rapidly, tailing at 750° to a constant. (ii.) The refractive index remains more or less constant at first, but subsequently, with an increasing furnace temperature, it increases rapidly. (iii.) Density varies as with refractive index. (iv.) The proportion of liquid more volatile than hexadecane is very small up to 615°, and then increases rapidly with increasing temperature; it is greater the longer the furnace. (iv.) The iodine value increases to a maximum at 700° for furnaces "48" and "64," at 750° for furnace "32"; it becomes constant at 750° for furnace "16." (vi.) The solubility in dimethyl sulphate (index of aromatic content) increases with rise in temperature from 685° to 815°, and is greater the longer the furnace.

W. S. N.

V. Influence of Temperature and of Rate of Flow, with Constant Length of Furnace. *Ibid.*, pp. 7174-7177.

Furnace "32" was used; the temperatures were 540°, 615°, and 685°; the rates of flow ½, 1, and 2 c.c. per minute. (*a*) *Gaseous products.* (i.) The proportion of gas increases with temperature and decreases with rate of flow. (ii.) The proportion of unsaturated material increases up to 615° and then decreases; it is greater, the greater the flow of hexadecane. (iii.) The proportion of hydrogen increases with temperature and decreases with increasing rate of flow. (iv.) The proportion of saturated gas decreases up to 615° and then increases; it is greater, the less rapid the flow of hexadecane. (*b*) *Liquid products.* (i.) The recovered liquid diminishes with rising temperature and increases with decreasing rate of flow. (ii.) For a rate of flow of ½ c.c. per min., the refractive index decreases up to 615°, and then increases. For 1 c.c. per min. and 2 c.c. per min. the refractive index decreases with increasing temperature. (iii.) Density varies in the same sense as refractive index. (iv.) The fraction more volatile than hexadecane increases with the temperature; it is greater, the slower the rate of flow. (v.) The iodine value increases with temperature and decreases with increasing rate of flow. (v.) The liquid was insoluble in dimethyl sulphate except when the furnace temperature was 685° and the rate of flow ½ c.c. per minute, when 35 per cent. of the recovered liquid was soluble.

W. S. N.

497. *Polymerisation.* X. Action of Certain Silicates on Unsaturated Compounds. S. W. Lebedev and E. P. Filonenko. Ber., 1925, **58**, [B], 163—168.

Unsymmetrical di- and tri-substituted ethylene derivatives are polymerised by Florida earth when kept in contact with it for a long enough period, the time necessary depending on the hydrocarbon. Mono- and symmetrically di- and tetra-substituted derivatives remain unaffected. At a higher temperature depolymerisation of the polymerised hydrocarbon can often be effected, but although the process usually occurs quite readily, it is sometimes complicated by the formation of carbon in greater or lesser amount or of substances isomeric with the original material. The Florida earth employed was activated by heating it to 275—325° until 12—12·3 per cent. loss of water occurred. Heating above this temperature produces a less active catalyst. The relative efficiency of the catalyst was determined by observing the amount of moistening which occurs on treatment with gaseous *iso*butylene. It was found necessary to employ quantities of Florida earth varying from 25—100 per cent. of the weight of the hydrocarbon, in order to obtain good results.

S. F. B.

498. Formation of Fatty Acids from "Protoparaffin." J. Marcusson. *Chem. Zeitung.*, 1925, **49**, 166.

The oxidation of ceresin (m.p. 62—71°) by oxygen at 125° in the presence of manganese dioxide on fuller's earth takes place much more slowly than with the lower paraffins. Thus, after 35 hours the acid value of the product had only reached 21, but by increasing the temperature to 150° C., in 90 hours the acid value of the product reached 39. The softened ceresin was separated by the method of Hönig and Spitz, into saponifiable and unsaponifiable fractions, the latter being found to contain alcohols and ketones together with both saturated and unsaturated hydrocarbons. The acids were separated by Varrentrapp's lead salt method into solid and liquid fractions. The solid acids melted at 60—62°, had an acid value of 146, corresponding with a molecular weight of 384 and were soluble in alcohol, light petroleum and so on. From these properties the author concludes that they are branched chain derivatives formed from *iso*paraffins in the original ceresin. The liquid acids contained hydroxy acids insoluble in

light petroleum, but consisted in the main part of a thick soluble oil, acid value 115, iodine value 11, and a density less than 1, probably a mixture of polymerised unsaturated fatty acids. S. F. B.

499. Hydrogenation of Benzene in the Presence of Metallic Copper. R. N. Pease and R. B. Purdum. *J. Am. C. S.*, 1924, **47**, 1435—1442.

The authors have found that in contrast to statements in the literature, the direct hydrogenation of benzene can be effected in the presence of metallic copper, as catalyst. Measurements of the velocity of the reaction up to 140° have shown that the temperature coefficient for the reaction, changes in an unusual matter in the region of temperature in which the reaction tends to remain incomplete. At sufficiently low concentrations of benzene, the reaction is monomolecular with respect to benzene; at higher concentrations, the benzene inhibits the reaction. S. F. B.

500. The Viscosity of Liquids Containing Dissolved Gases. John R. Lewis. *J. Am. C. S.*, 1925, **47**, 626—637.

A modification of the Washburn viscometer is described which can be employed to measure the viscosity of liquids containing dissolved gases. By means of it the author has examined the effect of the dissolved gas on the viscosity of the solvent. Working at atmospheric pressure and a temperature of 25°, with solutions of sulphur dioxide, varying in concentration from zero to saturation, in acetone, benzene, toluene, xylene and heptane, etc., as well as with chlorine in carbon tetrachloride, it has been shown that the viscosity is altered, the change depending on the solubility of the gas, viscosity of the liquid and of the gas (assuming it to be liquid at 25°) and the chemical natures of solute and solvent. For higher concentrations of gas, ranging from 0—100 per cent., in which it is necessary to employ pressure to keep the gas in solution, a modification of the Ostwald viscometer has been employed. In it, viscosity and fluidity curves for sulphur dioxide in acetone, ether, benzene, toluene, etc., have been obtained. The density curves for the same systems have also been determined and are given.
S. F. B.

501. Synthesis of Methanol by the Reduction of Carbon Monoxide. Georges Patart. Compt. rend. 1924, 179, 1330-1332.

Carbon monoxide and hydrogen in the ratio of 1:2 were circulated in a closed system for three hours at a pressure of 150—250 atmospheres over a catalyst heated to 400°—420°. The catalyst used was zinc oxide either in the granular form or deposited on asbestos. At the end of the run the ratio of carbon monoxide to hydrogen was 1:1. At a portion of the system cooled to 20° a liquid condensed composed almost entirely of methanol and water.
S. F. B.

502. An Improved Process of Making Metallo-organic Compounds. C. A. Kraus and C. C. Collis. E.P. 214,221.

Alkyl compounds of lead or other metals of the fourth periodic group may be obtained by treating the metal, alloyed with an alkali or alkaline earth metal, with the alkyl chloride or bromide under pressure, at a temperature above the boiling point of the alkyl halide. Zinc may be used as catalyst, 5-3 per cent. being added to the alloy. S. F. B.

503. Improved Process for Obtaining Gases Rich in Ethylene. *Chem. Fabr. vorm. Weiler-ter Meer.* E.P. 237,415.

Gases rich in ethylene may be obtained by the destructive distillation of tar oils, boiling above 250°, in the presence of steam at temperatures of 800°—900° C.
S. F. B.

504. Process for Transforming Oxides of Carbon into Oxygenated Organic Compounds. Badische Anilin-und Soda Fabrik. E.P. 237,030.

Oxides of carbon may be converted into oxygenated organic compounds, particularly methanol, by passing the oxides mixed with hydrogen at an elevated temperature and pressure over a contact mass containing two or more metals having reducible oxides, excluding iron, nickel, and cobalt. Suitable metals include zinc, copper, silver, cadmium, and lead. The presence of nitrogen in the oxides of carbon does not affect the results. S. F. B.

505. Process for the Reduction of Halogenated Hydrocarbons. *Société Chimique des Usines du Rhone.* E.P. 225,174.

Halogenated hydrocarbons, such as carbon tetrachloride, etc., may be reduced by treatment with ferrous hydroxide in the presence of water and of a basic substance. Suitable basic substances include the alkaline or alkaline earth bases, or salts of a strong bases with weak acids, i.e., carbonates. S. F. B.

506. Purification of Naphthenic Acids. C. Thieme. G.P. 412,821.

The naphthenic acids are converted into their glycol or glycerol esters, from which the naphthenic acids can be recovered by means of superheated steam more easily than from the alkaline earth naphthenates generally employed. The unsaponifiable and odourous constituents can then readily be removed. For soap manufacture the glyceryl esters can be mixed with natural fats, and saponified, the glycerine being recovered. S. F. B.

507. Drying Calcium Hypochlorite Compounds. *Chem. Fabr. Griesheim-Elektron.* E.P. 232,560.

Calcium hypochlorite, or basic hypochlorite, is dried by means of heat, with or without the use of vacuum, until it contains 1 per cent. of moisture. Quicklime, or some other dehydrating agent, is then added to remove the remaining moisture. The product obtained is very stable. S. F. B.

Lubricating Oils.

508. Producing Styrene and its Homologues from Aromatic Hydrocarbons. I. Ostromislensky and M. G. Sheppard. U.S.P. 1,541,175.

Styrene or a corresponding homologue is produced by passing ethyl benzene, xylene or a higher homologue through a tube heated to a temperature of 450°—700°. With xylene or its higher homologues migration of a methyl group from the nucleus to the side chain also occurs. S. F. B.

509. Catalytic Oxidation of Secondary Alcohols. A. A. Wells. U.S.P. 1,541,545.

The secondary alcohols, obtained mixed with hydrocarbons from the olefines present in cracking gases, are mixed with air and passed as vapours, with or without the addition of steam, over a catalyst heated to 100°—250°. Suitable catalysts include copper oxide, manganese dioxide, barium peroxide, silver and copper. S. F. B.

510. Making Acids from Aromatic Hydrocarbons. J. F. Norris and E. W. Fuller. U.S.P. 1,542,264.

Benzene is added to a carbon disulphide solution of phosgene in the presence of anhydrous aluminium chloride at 0° C. The oil obtained is treated with ice water and caustic soda. Sodium benzoate, together with a little diphenyl ketone, is produced. S. F. B.

511. Heat of Wetting of Oils and Metal and its Relationship to Lubricating Power. W. Bachmann and C. Brieger. *Koll. Zeit.*, 1925, **36** (Zsigmondy-Festschr.), 142—154.

The higher the lubricating power of an oil, the higher its heat of wetting against finely divided copper. Experiments were made using a 50 per cent. solution of various oils in benzene (which has a low heat of wetting), the heats of wetting for the pure oil being then calculated. For 100 gm. of copper the heats of wetting were: Castor oil 12·1 cals., linseed oil 13·8 cals., and liquid paraffin 3·85 cals. Petroleum alone gave 5·7 cals., and the addition of 1 per cent. oleic acid increased the value to 21·3 cals. W. S. N.

512. Surface Tension Measurements of Drilling Oils and Soap Solutions. Von der Heyden and Typke. *Petroleum Zeitung*, 1925, **21**, 921—925.

It has been shown from the experimental data given that the surface tension is a factor of great significance in selecting oils and soap solutions for drilling purposes. The drop size of the oil is decreased by increasing the soap content. A method is described for determining the wetting ability of a drilling oil emulsion. S. F. B.

513. Formation of Sludge in Transformer Oils. B. Tychinin and N. Butkov. *Neftjanoe Slancevoe Chozjajstvo*, 1924, **7**, 341—349.

Transformer sludge consists of salts of organic acids, varying from C_{11} to C_{22} acids, which are produced by the oxidation of the oil. Certain metals, including lead and copper, but more particularly lead, accelerate the oxidation, the rate of acid formation in the presence of the latter metal increasing with time, although almost imperceptible in the first hour. Other metals, *e.g.*, zinc, tin and iron, have no catalytic action. Sludge formation differs very considerably in different oils, but resin, if less than 2 per cent. is present, has no deleterious effect. Transformer oils may be tested as follows: 100 ccs. of the oil are heated at 120° C. for 70 hours, in the presence of a piece of copper gauze 7×1·5 cms., oxygen, at the rate of 6—7 litres per hour being passed through it all the time. On pouring the hot oil into a graduated cylinder, the sludge can be measured directly. The resin content and acidity of the oil can also be determined. S. F. B.

514. The Oxidisability of Transformer Oils. B. Tytschinin and N. Butkow. *Chem. Zeitung*, 1925, **96** II., 253 (cf. B. 1925, 161).

As the refining of oil with Florida earth increases its oxidisability, so refining with oleum has a still stronger influence in this direction. The difference in the behaviour of different oils depends on their treatment with oleum or ordinary sulphuric acid. The addition of a trace of the original oil or of the kerosene distillate restores its resistance to oxidation to oil treated with oleum. The acid value of the oil increases on passing oxygen through it, first slowly, then rapidly, and then slowly attains a maximum, which is higher, the better the refining of the oil. The protective action of the original oil or of kerosene is probably due to the formation of compounds of the aromatic hydrocarbons with the substances which occasion the oxidation. H. M.

515. The Sludging Test for Transformer Oils. Von der Heyden and Typke. *Pet.*, 1925, **22**, 1377—1383.

In such tests it is not necessary to reproduce the conditions of the transformer so long as the results obtained are concordant and give a correct indication of the behaviour of the oil in use. The chief factors causing the deterioration of oils in transformers are oxygen, heat, and catalysts. The presence of oxygen has great influence; the presence of sulphur not so great an influence as was formerly supposed. 120° C. is considered to be the proper maximum temperature, as above this, changes set in which are not repro-

duced in the transformer. Little is known of the influence of the electric field, but it is not great. The presence of unsaturated compounds promotes the formation of sludge. Comparisons are made of the results of the German sludging test, accepted by the electric firms, and a method of sludging for 50 hours at 120° C., without oxygen, the Schwarz-Marcusson method, tests of 70 hours at 120° C. without oxygen, 48 hours at 120° C., and 24 hours at 120° C. The results are not nearly concordant with the standard German sludge test. Test with the sodium peroxide method gave moderately concordant results, and it is suggested that this test might be of practical value if frequently checked by the standard sludge method. The value of the standard sludge test is greatly reduced by the omission of oxygen and the reduction of the time of testing to 50 hours. H. M.

516. The Necessity for More Strict Testing Conditions for Transformer, Switch, and Turbine Oils. Von der Heyden and Typke. *Petroleum*, 1925, **21**, 1553—1554.

The testing methods adopted for these oils in Germany, Sweden, and some other countries rest on the estimation of the products of decomposition dissolved in the oil, the amount of sludge deposited having not much to do with the tar value. It is proposed to conduct the test by heating 150 g. of oil in a 300 cb. cm. Erlenmeyer flask to 120° C. for 70 hours. After the oil has then been allowed to stand for an hour any oil that has deposited sludge is excluded as unfit for use. If none is deposited the tar value is determined on 50 g. of oil. The oil is mixed with three times its volume of normal benzene and allowed to stand twelve hours, when the oil is rejected if sludge has been formed. In the case of dark oils only it is necessary to detect the sludge by filtration. H. M.

517. Deterioration and Reclamation of Used Automobile Crank-case Oil. A. E. Flowers, F. H. McBerty, and R. Reamer. *Ind. and Eng. Chem.*, **17**, 481.

Current views on the question of crank-case dilution of automobile lubricating oils are discussed. Characteristics of sixteen samples of oil when new, after use, and after reclaiming, are tabulated; a description of the steam distillation method employed for estimating dilution is given. Details of a commercial reclamation equipment, which consists of a treating tank in which the hot oil is mixed with trisodium phosphate solution, a centrifugal oil purifier, an oil heater, and an evaporating tower are given. A bibliography is appended. R. W. L. C.

518. Refining Mineral Oils. W. T. Maloney. U.S.P. 1,540,218. 2.6.25. Appl. 18.3.24.

Transformer oils are produced by oxidising the sludging constituents of mineral oils with an oxygen-containing gas. An alkaline reagent is then added to precipitate the oxidised substances. T. A. S.

519. Lubricating Oil and Process of Production. W. F. Faragher, R. W. Henry, and H. A. Gruse, Assrs. to Gulf Refining Co. U.S.P. 1,550,608. 18.8.25. Appl. 17.7.24.

The lubricant consists of mineral oil containing aluminium oleate, the ratio of oleic acid to aluminium being 1:1. T. A. S.

520. Separating Paraffins from Liquid Hydrocarbons. Aktiebolaget Separator-Nobel. Swed. P. 58,706.

The hydrocarbons to be separated are thoroughly cooled until the paraffins commence to separate. The addition of a liquid hydrocarbon, before, during or after the cooling, having a gravity higher than that of the heaviest paraffin to be separated, to increase the specific gravity of the liquid to above that of the heaviest paraffin, causes the paraffins to separate in such a manner that they can be removed by centrifugal force. S. F. B.

521. Natural and Artificial Solutions of Paraffin Wax. M. A. Rakusin. *Petroleum*, 1925, **21**, 1498—1499.

The paraffin waxes behave with organic solvents as gelatine behaves with water. Natural crude oils with a wax content of about 6 per cent. solidify at about 8° C. Asphaltic substances precipitated by sulphuric acid favour the solution of wax in crude oil. The point of saturation at 19° C. of Tscheleken wax in benzene was 9·34 per cent., in toluene, 9·74 per cent., and in xylene 9·90 per cent., and in benzine at 20° C. 11·82 per cent. A 1 per cent. solution of wax in benzene forms a jelly at 5° to 7° C., and 2·2 per cent. solutions in benzene or xylene and 3·53 per cent. solutions in chloroform, turpentine, or carbon disulphides, form very stiff jellies. The difference between natural and artificial wax solutions is probably due in part to the isomeric conditions of the wax. Thus on centrifuging a wax-containing crude (6 per cent.) with 20 per cent. of amyl alcohol or turpentine a residue of 19·7 per cent. remained in the centrifuge, but similar wax-containing artificial crude oils gave no residue. The solidification point of fractions from benzine to machine oil containing 6 per cent. of wax ranged from −3° C. to 20° C., the spindle oil and machine oil solutions solidifying in the centrifuge. H. M.

522. Utilisation of Paraffin by Micro-organisms. W. O. Tausson. *Biochem. Z.*, 1925, **155**, 356-368.

Certain moulds, fungi, and bacteria, are described capable of utilising vaseline or paraffin wax as a source of carbon. A mixture of esters of higher fatty acids and alcohols is formed as an intermediate product. One mould, allied to *Aspergillus flavus*, has been isolated, which, grown aërobically in a synthetic medium, is able to decompose 75 per cent. of the paraffin. The optimum hydrogen ion concentration lies between 7·0 and 8·0. S. F. B.

523. Analysis of Oil Wax Mixtures. L. D. Wyant and L. G. Marsh. *Oil and Gas J.*, 1924, **23**, No. 31, 116—118.

Five grains of the oil-wax mixture to be analysed is boiled under reflux in an Erlenmeyer flask of 100 c.c. capacity with 35 c.c of acetone. The hot liquid is transferred to a large test tube, which is immediately stoppered to prevent evaporation, the flask washed out with another 15 c.c. of acetone, and the washings added to the main bulk in the test tube. After cooling to 60° F. the contents of the test tube are filtered, washed with a further 50 c.c. of acetone, and the filtrate distilled to remove the acetone. After drying in a vacuum the residual oil is weighed. The wax is given by difference. S. F. B.

524. Apparatus for Separating Wax from Mineral-Oil Lubricating Stock. C. H. Hapgood, Assr. to The De Laval Separator Co. U.S.P. 1,544,747, of July 7th.

An apparatus for continuously separating the wax from the oil, comprising a preliminary double pipe chiller and a final double pipe chiller, the chillers comprising a continuous conduit through which the solution of oil and wax flows continuously, each of chillers comprising a second conduit arranged in heat exchange relation with the first conduit, and through which the chilling fluid is passed, and a centrifuge communicating with the first conduit, and into which the refrigerated stock is continuously fed, with a discharge for wax-free oil communicating with the second conduit of preliminary chiller. H. M.

525. Refining Oil. L. D. Fulton, Assr. to The De Laval Separator Co. U.S.P. 1,544,734, of July 7th

A method of separating wax from mineral oils, comprising the slow flowing of a large volume of oil along a downward path without agitation or change of direction, in a stream of large cross-sectional area compared with

the length of its path of travel. Subjecting the flowing oil to gradual cooling by indirect contact with a cooling medium passing in a counter current to the oil. Centrifugally separating the oil so cooled. H. M.

Cracking.

526. Oil Converting Apparatus Dome. J. H. Adams, Assr. to The Texas Co. U.S.P. 1,540,894, 18.8.25. Appl. 27.2.20.

The apparatus consists of a column with a lower liquid cistern into which hot cracked oil is pumped. From the lower cistern it passes by a central tube into a vapour space where a portion is vaporised, the vapours being removed through a vapour off take. The unvaporised oil flows through an overflow device to an outlet. Solid residue settling out of the oil in the lower chamber is removed through a special outlet. T. A. S.

527. Production of Oil-gas by Destructive Distillation of Oils, Especially of Highly Viscous Mineral Oil Residues. A. V. Lupinsky. G.P. 405,379.

The oils are decomposed in an atmosphere of inert gas, such as nitrogen, ammonia, methane, etc., which may be introduced under pressure and allowed to expand during the heating. S. F. B.

528. Production of Mixtures of Hydrocarbons, Resembling Benzine. H. Goldschmidt and O. Neuss. G.P. 402,991.

Low boiling unsaturated hydrocarbons such as those produced during cracking, boiling between 60°—150°, are mixed with hydrogen chloride and passed over suitable catalysts, treated electrically to 270°—350°. Suitable catalysts include iron, in the form of turnings or gauze, nickel cobalt, or zinc. The products are condensed, the hydrogen chloride returned to the process, and the condensed liquid rectified, when a colourless liquid boiling up to 150°, having the properties of benzine, is obtained. S. F. B.

529. Process and Apparatus for Treating Hydrocarbons and Similar Compounds. Alfred Schwarz. B.P. 211,487.

A substantially constant mixture of saturated and unsaturated hydrocarbons, heated to about 260° C., is agitated with a gas relatively rich in hydrogen to form a gas-oil emulsion and the temperature changed until reaction takes place. The hydrocarbons are proportioned so that there will be present compounds relatively high in hydrogen (about 2 to 4 parts saturated compounds) for reaction with substantially all the compounds relatively low in hydrogen (about 8 to 6 parts unsaturated compounds). In a series of hydrocarbons ranging from asphalt to gas, when heat is applied, the hydrocarbons of lower range tend to combine with the hydrocarbons of higher range or series, which in turn tries to combine with hydrocarbons of the next higher series, and so on, provided the proper proportions of saturated and unsaturated hydrocarbons exist at each step. Hydrogen must be furnished, which can be done by removing carbon, in a carbon furnace, leaving a higher percentage of hydrogen in the hydrocarbon. It is claimed by using this system, a mixture of 40 per cent. saturated compounds boiling range of 225° to 315° C., with 60 per cent. fuel oil (which had been previously cracked in a Burton still), was converted, in a single operation, into 38 per cent. gasoline, boiling range 60° to 225° C., 30 per cent. of kerosene and 12 per cent. gas oil. R. P.

530. Apparatus for Removing Carbonaceous Material from Oil Apparatus. L. C. Huff. U.S.P. 1,548,004.

A heavy steel chain or cable is suspended from the man-hole lid, for example, a large reaction chamber, being hooked, at intervals throughout its length, to the sides of the vessel. When a deposit of carbonaceous

material has been formed the chain will be contained within it. Provision is now made for pulling vertically on the upper end of the chain, which is thereby removed successively from the hooks in the side of the vessel, and as the chain is withdrawn the mass of carbon is broken up and removed with the chain. W. S. N.

531. Cracking and the Chlorination of its Products. Y. Ragaz, H. Paillard, and E. Briner. *Helvetica Chim. Acta*, 1925, **8**, 225-229.

The maximum production of unsaturated gases by the cracking of kerosene, b.p. 163°—300°, d_{21} 0·8121, using iron turning as catalyst, occurs between 650°—675° C. Between these temperatures, 30 c.c. of oil produces 4·01 c.c. of unsaturated gases and 9·11 c.c. of saturated gases and hydrogen. Chlorination is best effected by introducing a slight excess of chlorine into the gases issuing from the cracking tube at the ordinary temperature. Heat is evolved and the temperature rises to 50°—60°. Other methods of chlorination involving cuprous chloride or ultra-violet light give poorer yields. Approximately 170—180 gms. of the chlorination mixture was obtained in this way from 180 c.c. of oil, and on distillation it gave three fractions having the following properties: b.p. 65—100° C., d_{22} 1·2464 and chlorine 70—69 per cent.; b.p. 100°—125°, d_{22} 1·3266 and chlorine 73·41 per cent.; b.p 125°—150°, d_{22} 1·3963 and chlorine 75·14 per cent. S. F. B.

532. Process for Converting Hydrocarbons and Mineral Oils Having a High Boiling Point Into Those Having a Lower Boiling Point. H. Wolf. E.P. 215,336.

Cracking is effected by pumping a high boiling oil through a steel coil, heated directly or indirectly, in such a way that a temperature of 400—450°C. is maintained in the oil within a time limit of 30 to 80 seconds, whilst a pressure of above 20 but not more than 300 atmospheres is employed. The gases and vapours produced are caused to expand immediately after leaving the coil, through a suitable valve, into a vapour separator. A speed of one metre per second, through the coil, is employed. W. S. N.

533. Improvements in Liquid Fuels. A. A. F. M. Seigle. E.P. 216,150, of July 9th. (See prior specifications 185,140 and 190,723.)

To produce a liquid fuel from crude petroleum or shale oils, fuel oils, gas oils, etc., the material is heated in a still to 350° C. and the vapours passed into a worm retort at normal pressure, where they circulate between plates on which are placed metallic chippings at a temperature of 520° to 530° C. Catalytic action takes place, and the heavier hydrocarbons are depolymerised into products containing smaller molecular groups. The vapours then pass to an expanding and cooling vessel in the form of a double truncated cone, in which a constant temperature of 200° to 220° C. is maintained by a jacket of water boiling under a pressure of 10 to 12 kg. per sq. cm. The vapours issuing from this vessel undergo expansion and cooling, causing molecular expansion and contraction. The liquid from the bottom of this vessel is led by a return pipe to the still, serving to preheat the crude oil fed to the still. The vapours pass to a second conical vessel, maintained at about 135° C. by water boiling at 3 kg. per sq. cm. pressure, in which the temperatures of the vapour drops to about 180° C. The liquid condensed in this vessel is drained into the return pipe from the first conical vessel, and there is vaporised and re-enters the first conical vessel. The vapours from the second conical vessel are condensed in an ordinary condenser and form the finished product. The fuel contains 14 to 13 parts hydrogen and 86 to 87 parts carbon and has a spec. gr. of 0·735 to 0·780. H. M.

534. Apparatus for Treating Hydrocarbons. W. E. Wilson and H. W. Wilson. U.S.P. 1,546,055.

The authors describe apparatus in which hydrocarbon oils are subjected progressively to varying degrees of heat. W. S. N.

535. Transformation of Heavy Mineral Oils into Benzine. L. Dal Prato. *Rass. Min. Met. Chim*, 1924, **61**, 118—122; 1925, **62**, 12—14.

Heavy oils are converted to benzine in two phases: (1) Catalytic decomposition (metallic catalyst, not specific) at 600—650° giving benzine and gases. After the deposition of carbon in an expansion chamber the mixture is dephlegmatised and the condensed oil returned. The gases and vapours are then condensed, the benzine separated, and the gases collected for the second stage. (2) The gases are freed from sulphur compounds, and compressed to 5 atmospheres in an apparatus containing active iron and nickel. This stage is itself conducted in stages, the more volatile constituents being taken off through a blow-off valve as the pressure rises. The residual gas being compressed to 50 atmospheres, the temperature rises to 110°; after expansion into a cooling system the benzine is condensed. All condensates are united, giving a series of products resembling light petroleum oils. The process is applicable to residues from petroleum, heavy natural oils, bituminous schists, and oils from the distillation of tar from lignite, peat, or coal. The synthetic benzine contains up to 60 per cent. boiling below 200°. The uncondensed gas from the second stage is used for heating the original oil. W. S. N.

536. Method of Obtaining Gasoline from Heavier Hydrocarbons. A. D. Smith. U.S.P. 1,550,115., 18.8.25. Appl. 17.4.20.

After cracking and removal of light distillate the residual oil is filtered to remove particles of free carbon and centrifuged to remove colloidal carbon. It is then returned to the cracking zone. T. A. S.

537. Treatment of Hydrocarbon Oils. R. T. Pollock, Assr. to Univ. Oil Products Co. U.S.P. 1,550,568., 18.8.25. Appl. 26.1.25.

Oil is passed in a restricted stream, under pressure, through a heating coil, in which it is heated to cracking temperature and passes thence to a conversion chamber, where part is vapourised, the vapours passing to a dephlegmator in which incoming oil is preheated. The arrangement of the dephlegmator is such that pools of condensate are formed, through which the vapours must pass. The preheated oil and condensate are not mixed in the dephlegmator, but are afterwards mixed and passed through the cracking coil. T. A. S.

538. Cracking and Hydrogenation of Hydrocarbons. G. W. Wallace. E.P. 233,395, 1.2.24.

A vertical retort packed with catalytic material or with carbon is fitted at its upper end with a burner for the introduction of combustible material such as the gaseous products from some previous combustion and air. The flame produced impinges on a coil carrying the oil to be cracked, the oil heated in this manner being sprayed on to the catalytic material along with the gases from the combustion. Vapours drawn from the bottom of the retort are passed through the dephlegmators to a condenser. Valves are supplied for controlling the supply of combustible gases and air, and by the regulation of these and determination of the correct position of the spray the amount of cracking obtained can be controlled. T. A. S.

539. Process of Improving Oil. L. S. Abbott. U.S.P. 1,547,191.

Low grade petroleum oils are sprayed into an inert gas, e.g., producer gas, which has been previously heated to such a temperature that the mixture is at about 1160° F. Any asphalt which separates in the reaction chamber is drawn off. After air-cooling the mixture (during which process soot or lamp-black is deposited) it is water-cooled; heavy oil separates which may, for example, be used as a source of lubricating oil. The uncondensed

gas and vapours are now passed into a scrubbing apparatus, in which the hydrocarbon constituents are largely absorbed in, for example, lubricating oil. The issuing enriched producer gas is utilised elsewhere; the light distillate from the redistillation of the absorbent medium is a source of motor spirit, etc. W. S. N.

540. Pressure Still. J. E. Bell and E. W. Isom. U.S.P. 1,547,993, of July 28th.

In an oil still there is a drum to receive the oil to be cracked, divided into communicating compartments, the oil being fed into the first and flowing successively into the other compartments. A furnace has an elongated heating flue and a series of heating coils connected to the respective compartments of the drum. The coils are arranged in the heating flue to be impinged on by the heating gases in the same order as the compartments with which they are connected receive the oil. The successive heating coils have increasing heat absorptive surface to offset the decline in temperature of the heating gases. H. M.

541. Pressure Still. J. E. Bell and E. W. Isom. U.S.P. 1,547,994, of July 28th.

In an oil still there is a drum, divided into successive compartments, the compartments communicating, and means for supplying oil to the compartment at one end of the drum. A furnace has a heating flue, a series of separate heating units corresponding to the separate compartments in the drum being each connected to one compartment and extending into the heating flue, the unit connected to the compartment at the supply end of the drum being in the heating flue nearest the furnace. Pumps are connected to the compartments and heating units for circulating oil from the compartments through the heating units and back to the same compartment. H. M.

542. Apparatus for Treating Petroleum Oils. U.S.P. 1,540,764. Walter M. Cross.

The objects of the invention are to provide an apparatus in which crude oil is fractionally distilled, and the separate fractions treated in stages to produce further conversion. The relatively low boiling point distillates are refined and redistilled to produce finished gasoline, while the heavier fractions are directed into a cracking still to produce synthetic crude. The plant consists of a still connected to a series of dephlegmating towers. The vapours from the final tower pass through a condenser to a tank from which the spirit is drawn off into an agitator for acid refining. The spirit then passes into a steam still for redistillation. The refluxed products from the towers and the residue from the still pass to a cracking coil and reaction chamber, are cooled, and after separation of the gas are returned to the still along with fresh crude oil to be distilled and recycled through the plant. R. P.

543. Apparatus for Treating Petroleum. C. P. Dubbs, Assr. to Universal Oil Products Company. U.S.P. 1,546,634, of July 21st.

An apparatus for converting oil comprises a furnace, a heating coil therein, an enlarged insulated chamber outside the furnace, an insulating wall around the chamber, a transfer line between the heating coil and the chamber, a dephlegmator disposed at an elevation above the heating coil, a vapour transfer line from chamber to dephlegmator, and a residual draw-off line leading from the chamber. Also means for introducing charging stock to the dephlegmator to absorb heat from the vapours passing through it and to preheat the charging stock, means for collecting a body of charging stock and reflux condensate, a communication between the collecting means and the heating tubes for introducing the charging stock and reflux

condensate to the heating tubes, and means for maintaining a pressure above that of the atmosphere, on the oil undergoing conversion. H. M.

544. Process for Treating Petroleum Oil. C. P. Dubbs, Assr. to Univ. Oil Products Co. U.S.P. 1,550,607, 18.8.25. Appl. 5.4.23.

Oil is cracked by being passed through a heating coil under pressure. The highly heated oil is passed into a reaction chamber from which vapours pass to a dephlegmator, which is also a preheater, in which incoming oil is preheated. The preheated oil and reflux condensate are then pumped through the heating coil. Residual oil from the reaction chamber is not allowed to re-enter the heating coil. T. A. S.

545. Process for Treating Hydrocarbon Oils. Carbon P. Dubbs. U.S.P. 1,543,831 and 1,543,832.

This process consists in pumping the oil through relatively small heating tubes situated horizontally in a furnace and passing it into relatively large distilling tubes placed in the same horizontal plane as the heating tubes. Means are provided for causing independent cyclic circulation of the oil in the heating and in the distilling zones. The oil is maintained at a pressure above 50 lbs. R. P.

546. Process for Cracking Oil. C. P. Dubbs, Assr. to Universal Oil Products Co. U.S.P. 1,549,352, of August 11th.

A stream of oil is heated to cracking temperature, and is delivered to one of a number of enlarged alternative chambers. When coke has been deposited in this chamber the stream is diverted to the alternative chamber, previously heated by applying external heat. H. M.

547. Distilling Liquids. C. P. Dubbs, Assr. to Universal Oil Products Co U.S.P. 1,541,210.

Carbon deposited during continuous distillation of oil is prevented from collecting in the reacting or vapour chamber by provision being made for the flushing of the residuum draw-off line. An injector nozzle projects slightly into the residuum line and light carbon-free oil, hot or otherwise, is injected into the residuum line, flushing out precipitated carbon or other foreign matter. G. S.

548 Treated Carbonaceous Fuel. G. Egloff and Harry P. Benner, Assrs. to Universal Oil Products Co. U.S.P. 1,543,833, of June 30th.

An artificial fuel consisting of pitchy solid carbon freed from its oily constituents is obtained from the cracking of petroleum oil under heat and pressure by subjecting the pitchy carbon residue to the action of pressure distillate produced by the cracking of the petroleum oil to remove the liquid oil therefrom. H. M.

549. Apparatus for Cracking Oil. Gustav Egloff and Harry P. Benner. U.S.P. 1,540,934.

A heating coil is connected to an expansion chamber, which consists of a series of tubes gradually increasing in size, say, 8", 10", 20", and 30" in diameter, thus producing a smoother vaporisation than would otherwise take place. The vapours enter a dephlegmator to separate heavy oil (which returns to the feed) and spirit, which is condensed. Eldorado fuel oil of ·897 sp. gr. at 475° C. and 150 lbs. pressure yields 60 per cent. of ·778 sp. gr. pressure distillate containing 32 per cent. (on the raw oil) of ·748 spirit. R. P.

550. Process for Cracking Hydrocarbons. William M. Gomory. U.S.P. 1,537,164.

A continuous process which consists of mixing steam with the oil, forcing the mixture under 150 lbs. pressure through a coil heated to approximately 540° C., permitting about 15 to 20 per cent. of the hydrocarbons to remain in the liquid phase. The products are passed to an expansion chamber to separate light and heavy oils, returning the heavy oil and condensing the lighter vapours. R. P.

551. Process for Cracking Oil. Gustav Egloff. U.S.P. 1,537,593.

Fuel oil is heated in a coil to about 375° C. at about 135 lbs. pressure and delivered to an expansion chamber maintained under the same pressure. The vapours pass to a dephlegmator and the reflux returns through another coil in the furnace, heated to 410° C. at a pressure of 175 lbs., and expanded again into the vapour chamber. The reflux is continuously subjected to re-cracking, but at a different temperature and pressure. The dephlegmator condenser and receiver may be worked under a vacuum instead of under pressure by suitably regulating the vacuum pump attached to the receiver. R. P.

552. Apparatus for Treating Oil. Gustav Egloff and Harry P. Benner. U.S.P. 1,541,553.

Improvements in apparatus wherein the oil is fed through a heating coil, delivered to an expansion chamber, the vapours condensed and the heavier portions returned to the coil for further cracking. It is necessary to clean this type of plant periodically, and to do this the plant must be cooled down. In the ordinary way, by circulating cold oil, the process of cooling takes time, and the object of the present invention is to provide means for cooling rapidly. When the process comes to an end a bye-pass pipe between the coil and the expansion chamber is opened and returns the oil to the feed tank, so that cold oil can circulate through the coil only. Steam can be injected into the expansion chamber at the same time, thus cooling the apparatus rapidly. R. P.

553. Treatment of Hydrocarbons. George Frederick Forwood and John Gilbert Taplay. U.S.P. 1,541,697.

The invention consists in treating oils by passing their vapours mixed with steam over hot carbon capable of decomposing the water vapour when both oil and water vapours are at the same temperature, so that the carbon liberates hydrogen which is taken up by the oil. The inventors prefer to treat different oils at different temperatures, the lower the boiling point of the raw oil the lower is the temperature of cracking. In all cases the oil is forced through a jet into a retort in which the carbon is heated. The steam is injected at a point adjacent to the oil jet. After passing through the retort the vapours are condensed and the gases scrubbed to recover the spirit. R. P.

554. Method and Apparatus for Cracking Oils. Joseph George Davidson. U.S.P. 1,541,905.

In a process where cracking is accomplished by means of electrically heated "resistors" submerged in the oil, a deposition of carbon takes place on the rods which increases their thickness, thereby reducing the resistance and allowing an increased current to flow. This deposit is practically impossible to remove without injuring the rods. Instead, therefore, of using large "resistors" rods are used to start with and relatively small advantage is taken of the deposit to form a resistor of appropriate size. Means are provided to regulate the voltage as the resistor increases so that the input remains constant. The invention, therefore, avoids the necessity for removing the deposited carbon, and the provision of resistors of large size at the beginning is unnecessary. R. P.

555. Process and Apparatus for Distilling Oils. Hiram J. Halle. U.S.P 1,540,986.

The oil to be cracked is heated in a coil of tubing set in a furnace, and is transferred to a vapour chamber. The vapours pass to a dephlegmator and through a water cooler to a receiver. The vapour chamber may be of different designs. The heated oil, on being introduced at the top of the chamber, is spread on a spirally arranged plate within the chamber, or the oil may be introduced at the side of the chamber and circulates round a coiled baffle plate from circumference to centre. By controlling the oil level in the vapour chamber the temperature in the vapour chamber may be controlled and the rate of vaporisation regulated. R. P.

556. Process of and Apparatus for Distilling and Cracking. Alfonce H. Heller. U.S.P. 1,541,140.

The novel part of the apparatus consists of a revolving nest of tubes connected in series and situated horizontally in a furnace. Solid rods are placed in the tubes to grind away the carbon deposited in the tubes during cracking. R. P.

557. Improvements in and Relating to the Continuous Rectification of Hydrocarbons and Other Liquids Containing Constituents of High Boiling Point. *Soc. des Etablissements Barbet*. B.P. 208,175.

In this process the hydrocarbon is vaporised completely in a multitubular boiler by means of high pressure saturated or superheated steam. The material is introduced mainly or entirely in the vapour state into a rectifying column, wherein the vapour is subjected to the action of a liquid reflux condensed from the vapour, and the more volatile constituents are withdrawn as a plurality of fractions from the column. R. P.

558. Improvements in a Process of Evolving Hydrocarbons from Fuel. Clarence Bell Wisner. B.P. 217,554.

In the heat treatment of solid substances yielding liquid hydrocarbons it has been the practice to treat the fuel in retorts which are slowly heated. The outside layer of fuel is overheated, whereas the interior may be under heated, and the vapours produced are cracked on coming into contact with the overheated walls of the retort. In this process the fuel is first uniformly heated in a rotating cylinder to a temperature above steam producing temperature but below the volatilising temperature of the hydrocarbons, then confined in a second rotating container and supplied with external heat to complete the process. Enough external heat is supplied to carry the heat uniformly and quickly through each piece of the charge, causing the reaction to force open the pores and cause a complete evacuation of the hydrocarbons quickly and uniformly. In the process coal is entered through an intake pipe at one end of the upper cylinder, which is inclined to cause the fuel to travel to the outlet end. A current of air is drawn through the cylinder counter current to the flow of fuel. The dry coal is automatically discharged into the second cylinder, and travels its length to be discharged as coke, continuously. The cylinders are 16 times the diameter in length. The first cylinder is preferably maintained at about 260° C., and it has been found that the first gas and oil vapour pass from the second cylinder about 350° C. and beyond a temperature of about 455° C. So little liquid hydrocarbon is made that it is not profitable to carry the process further. A smokeless residual soft coke is produced in a form suitable for commercial and domestic use. The drying of the coal preliminary to coking renders the gums and resins inert and prevents the coal swelling and sticking to the sides of the retort. R. P.

559. Improvements in Pumps for Liquids at High Temperature. *L'Auxiliaire des Chemins de fer et de L'Industrie.* B.P. 224,220.

A pump for liquid at high temperature works in synchronism with a pump for the same liquid at low temperature, the cylinder of one pump being connected with the cylinder of the other pump, so that during one stroke the suction chambers communicate. Valve boxes are placed on the connection pipes, each containing two valves to open in opposite directions. The depression produced by the suction in the hot pump opens one of the valves and at the same time vaporisation takes place. The suction in the cold pumps opens the other valve and draws the vapour from the hot cylinder into the cold cylinder, where it condenses. This ensures the filling of the hot cylinder with liquid. R. P.

Geological and Fields.

560. Geological Notes on a Part of Southern Trinidad. C. G. Carlson. *Economic Geology,* March-April, 1925.

The author divides the island of Trinidad into five geologic provinces: (1) The Northern range, of Metamorphic rocks; (2) the broad belt of alluvial swamp and out-wash material (south of the above range); (3) the much-disturbed Cretaceous and lower Tertiary rocks of the Central Range; (4) the Naparima belt of Miocene and upper Oligocene for foraminiferal marls, clays, and interbedded sands; and (5) the Southern range, with a cove of rocks similar to those in (3), but which are largely covered by Miocene deposits in the southern part of the island. *Physical features.*—The Southern Range (av. elevation 150 ft.) is the most conspicuous feature in Southern Trinidad. The topography is rugged, with sharp-crested ridges trending about N. 70 to 80° East, parallel to the trend of the main ridge. These ridges include beds of hard calcareous sandstones, interstratified with easily eroded sands and sandy shales. Orbitoidal limestones form prominent isolated hills within the area of Oligocene and lower Tertiary beds. In the Cedros Peninsula and oilfield district the topography is rolling, and in the area covered by Quaternary deposits the ridges are broad and flat-topped. Many of the higher hills are of burnt carbonaceous shale or "porcellanite," and oil-impregnated sands. Where these reach the coast they form prominent points, such as Cedros Point, Point Fortin, and Port Galba. The low-lying swampy districts (e.g., the Oropuche-lagoon especially) are an outstanding physical feature and occupy an area of about 35 square miles. These are partly flooded at high tide, and, in places, are entirely under water in the wet season. *Stratigraphy.*—The greater part of southern Trinidad is covered by Miocene sediments, lying unconformably upon the Lower Tertiary and older beds. No Cretaceous beds are known in Southern Trindidad. *Eocene* rocks are also limited here to a few exposures in the Southern Range and fragments brought up by mud volcanoes. A glauconitic limestone forming Marac Hill covers several acres, and is correlated as Middle Eocene. It is an argillaceous sandy limestone, green when fresh and weathering to a red colour. The mid Eocene was a period of erosion as proved in the Central Range, the upper Eocene sediments being deposited upon a basal conglomerate containing large boulders derived from the denuded rocks. This horizon can be traced across the island. The upper Eocene is scantily represented in the Southern Range by algal and orbitoidal limestones, hard marls and interbedded sand shale and sandstones. Some of the Eocene beds are petroliferous. *Oligocene.*—Sediments of this age are limited to small areas in the Southern Range and to a narrow zone along the Lamont La Fortune anticline. Their total thickness is probably not over 600 feet. *Miocene.*—These spread unconformably over older beds in most of Southern Trinidad; for the most part they lie on Oligocene rocks, the time-hiatus allowing the latter beds to be slightly folded and faulted prior to denudation. There is no evidence of any Miocene erosion period. In the Cedros Peninsula the

Miocene thickness is over 7000 feet. The beds consist of sands, sandstones, sandy shale, clays and lignites laid down under estuarine and deltaic conditions, and in lagoons. The Miocene deposits are divided into the Moruga and Naparima formations, the latter containing the oil-producing sands. The "Moruga" is more arenaceous, with thick, coarse-grained massive sands, while the "Naparima" consists of fine-grained sands, with clay or clay shale. The source of these Miocene sediments is believed to be the mainland of South America; this is suggested both by the lateral variation of the sediments and their mineral composition. *Quaternary.*—These overlie older sediments unconformably; their greatest area is in the Cedros Peninsula. They are largely loose yellow, red, and brown sands and grey blocky clay. There is evidence in Southern Trinidad for considerable uplift in recent times. Raised beaches are seen along the coast, and some of the porcellanite hills (upper "Moruga") have wave-cut terraces marking former shore lines. The maximum thickness of the Quaternary deposits is some 200 feet. *Structure.*—There are in the area dealt with in this paper, three major structural units—(1) the southern anticline adjacent to the south coast and extending along the Southern Range; (2) the Point Fortin-Forest Reserve zone of uplift; and (3) the broad shallow syncline lying between (1) and (2). There are besides some minor folds upon some of which are located the various oilfields and the famous Pitch Lake. The close folding along the crests of the anticlines is in great contrast with the broad, shallow synclines. Two sets of faults are found within the folded zone of the Southern Range, one "strike" set trending about N. 70° E., and another set N. 10° to N. 20° W. The former are marked by intense fracturing and crumpling, and in places by the presence of mud volcanoes. The structure in the Oilfield district is relatively simple. There is some minor faulting along the crests of some of the anticlines. The Forest Reserve-Apex district shows three elongated domes. The author concludes with a brief account of the mud-volcanoes and mud-flow breccias. Their distribution is limited to the area of outcrop of the complexly faulted and folded Miocene beds ("Naparima") exposed along the Southern Range, which indicates a genetic relation to the folding and faulting, whilst their position suggests that they are formed by gases coming chiefly from the Oligocene or older beds.

J. E. M. H.

RUMANIAN OIL FIELDS. S. L. Mason. *Bull. of Amer. Assoc. of Petr. Geologists*, Jan.-Feb., 1925, pp. 145-157.

In his introduction the author states that the Gulf Coast salt domes differ from those in Germany, firstly, by the association of "mother salts" in the latter, and the comparative lack of any considerable oil production. He specially considers the case of Rumanian salt in this paper. The region discussed is the old Wallachian and Moldavian provinces. Dividing the region into three zones, he notes that on the North and West the Carpathian Mountain system is composed of crystalline metamorphic rocks with igneous intrusions and distorted remnants of Jurassic and Cretaceous sediments. On the South and East lies the Rumanian Plain of horizontal Quaternary beds. Between these two zones the broad band of foothills marks the area of folded Tertiary strata. The distribution of the Rumanian oilfields is governed by lines of folding related to the major Carpathian *overthrust* faulting, production being focused around salt masses ("Highs"). The rise of the salt is due to lateral pressure. The sources of the salt and the oil are disputed. The author believes that the latter originated in the Pliocene. *Salt.*—The masses are scattered from the edge of the Quaternary across the mountains into Transylvania, and tend to form curves parallel to the Carpathians. They pierce the youngest Tertiary beds, but their base is unknown. They are most numerous along the edges of the overthrust, but the most interesting "salt domes" are in the outer and oil-bearing belt. They are found on the lines of the Post-Pliocene folding,

forming a series across the Tertiary belt and disappearing under the Quaternary. The structure of the Tzintea, Baicoi, Moreni, etc., are typical of this folding. The salt masses are ellipsoidal with long arcs parallel to the fold. The sides are flexed, but more or less vertical, one side showing the typical overthrust lip at the top. The oilwells on the overthrust side therefore pass from recent beds into salt and traverse this to reach the Tertiary, where there is production. In the main part of the salt core depths of over 1,800 feet were recorded still in salt; these were abandoned, and on this other side those that strike salt never pass out of it. The salt is practically pure sodium chloride, but clays, sands, etc., have been folded in mechanically, especially near the top. Gypsum and anhydrite do not form any sort of "cap-rock" (tête du gisement). That the salt rose as a solid plastic body is shown by its flattened, undulated form and by its position in the folds. The rise is clearly indicated as due to lateral pressure, but several hypotheses exist in explanation of the mode of action. As regards the origin of the salt, the author mentions that the accepted idea of its proceeding from the Mediterraneans of the Miocene ("Salifère") is now generally discredited. P. Voitesti moves its source lower and lower, until he finally suggests a precipitation on the cooling earth-crust. Vulcanists claim that it is from emanations of volcanoes (unknown as yet in this region). *Oil production.*—This is all from the Tertiary of the Sub-Carpathian region—mostly from the Pliocene of the southern curve, the district of typical "salt dome" oilfields. All the region is heavily faulted, so that traces of oil have been found in practically every horizon. A "migration" theory is that the oil ascended along paths opened by the salt. Finally, a summary of conditions show more dissimilarity than resemblance with those of the American Gulf Coast region. Incomparably greater movement is manifest in Rumania than in the last-named. J. E. M. H.

561. Relation of Earth Temperatures to Buried Hills and Anticlinal Folds. W. T. Thom, Jr. *Econ. Geol.*, 20, 524, Sep.-Oct., 1925.

The distribution of heat within the earth's crust is likely to reflect structural irregularities, and may, therefore, be a guide to gas and oil pools. In the Salt Creek field of Wyoming, Van Orstrand found that the temperature gradients in wells varied according to their position on the structure, being steepest near the crest. A structure map could have been drawn on the basis of temperature measurements alone. Various explanations are possible of the more rapid rise in temperature above the structural crest. The most probable is that the lower beds, brought nearest to the surface in the axis of the fold, have not had time to cool. It is believed that the Salt Creek folding was developed by thrust from below, producing elevation and tension in the upper beds where the temperatures were measured. It is, therefore, unlikely that friction during folding was the source of the heat. Nor can it be ascribed to the circulation of heated artesian waters, because the syncline, separating the dome from the artesian intake in the Big Horn Mountains, is very shallow.

The dips suggest the presence of a deep-seated intrusion beneath the dome. It is not, however, thought that radiation from so deep a source can explain the gradients, since it could hardly bring them into such close relationship with the superficial structures. The uplifts where these relations have been observed are all of comparatively recent geological date. It is believed that the temperatures of the rocks are still roughly proportional to their original depth. Whatever the explanation, it is thought that the phenomena at Salt Creek may be helpful elsewhere, abnormally steep gradients suggesting concealed folds. Darton observed that the gradients above old hills, unconformably covered, were abnormally low. The oil occurrences in south-east Oklahoma are related to such old hills; and systematic temperature determinations in existing deep borings might yield enough evidence to justify further drilling in the Great Plains States where no other geological guidance is available. W. G. W.

562. Correlation of Oil Sands by Sedimentary Analysis. A. C. Trowbridge and M. E. Mortimer. *Econ. Geol.*, 20, 469, August, 1925.

The paper is an account of an investigation carried out in the University of Iowa to discover whether producing oil-sands could be recognised and correlated by their physical characters. Fifteen samples each from the Wilcox, Hominy, Bartlesville, and Elgin sands of north-eastern Oklahoma were examined as follows:—Microphotographs were made of each sample. For this, three methods were tried:—(1) Transmitted light with the sand in a liquid of widely different refractive index. (2) Transmitted light without immersion. (3) Reflected light above black paper. Of these, the last was found most useful. From these photographs the percentages of grains of different shapes were determined, their numbers being registered under four headings, viz., rounded, fairly well rounded, subangular, and angular. Mechanical analysis into sizes was carried out in sieves with apertures of 2, 1, ½, ¼, ⅛, and 1/16 millimetres. For the mineral analysis, a primary separation by bromo-form of sp. gr. 2·8 was made into quartz, felspar, and calcite on the one hand, and heavy minerals on the other. The quartz, felspar, and calcite were separated by bromoform-benzol mixtures, and the heavy minerals identified by ordinary microscopical methods. A watch was kept for micro-fossils which were identified as far as possible under a binocular microscope. It was necessary to record the above determinations in such a way as to make them easily comparable. This was done by the use of standard diagrams of which examples are given. They show graphically: (1) For the mechanical analysis, the percentage of grains of each size. (2) For the shape analysis, the percentage of grains in each shape category. (3) For the mineral analysis, the number of grains of each mineral in a sample of given size. The mineral was placed into one of four grades—rare, common, abundant, and very abundant—set up arbitrarily according to the number of grains. Quartz was described as very abundant if it constituted more than 90% of the sample. The mineral analysis was carried out separately for each size grade, and the whole combined into one diagram showing for each size grade the abundance of each mineral. The results of applying this practice to the sixty samples are described in detail, and the conclusion is drawn that in this case certainly, and probably in many others, sands may be correctly correlated by their physical characters.—W. G. W.

563. Process is Evolved to Recover Oil from Bituminous Sands. Lawrence E. Smith. *Nat. Petr. News*, XVII., 23, pp. 31-33, June 10, 1925.

The McClave process, which relates to the recovery of oil from bituminous sands, is based on the effect of a special reagent said to be cheap in cost. The reagent, which is a colloidal clay, is mixed with the oil-bearing sand in a pug mill at a temperature under 200° F. With water the reagent forms a soapy solution, which scours each grain of the sand. In the mill the sand is reduced to pulp, the oil rising to the top. From the mill the pulp passes through a floatation machine, the oil rising to the surface. From this the oil passes through a centrifugal machine from which it drips as a "mastic," which is subsequently divided in a special type of continuous retort into crude oil and asphalt. An average of tests on Athabasca sands showed 240 lbs. of oil per ton of 2,000 lbs. of sand. G. S.

564. Improvements in Apparatus for Enlarging the Bores of Hollow Drills and the Like by Drifting. E.P. 228,436.

A machine suitable for the above purpose is described, and consists of a hydraulic hammer which deals repeated blows on to a punch, so constructed that the bores of hollow drill stems or rods may be enlarged thereby The same mechanism is adapted to release the punch from the drill stem.
W. H. T.

565. An Indicating Device for Sub-aqueous Rock-cutters. E.P. 229,433.

A rock-cutting apparatus is described in which there is an attachment for measuring the rise and fall of the drilling bit. A friction roller mounted on a swinging frame bears against the rope drum, and by means of a thin cable, causes a weight to move up and down a suitably graduated scale. Slackening of the cutter rope automatically adjusts the indicator on each stroke by temporarily throwing it out of operation when the cutter strikes the bottom. W. H. T.

566. Rotary Apparatus for Drilling Oil Wells and the Like. E.P. 229,514.

A rotary table is described which is mounted on a stationary base and fitted with one or more thrust brackets. These thrust brackets are adapted to engage complementary surfaces on the table, and to transmit the lateral thrusts of the table to the base. The thrust brackets are provided with vertical faces and formed on depending lips integral with the brackets and concentric to the vertical axis of rotation. W. H. T.

567. Improvements in or Relating to Apparatus for Taking Geological Specimens from Bore-holes. E.P. 229,936.

This invention relates to apparatus for orienting or ascertaining the azimuth position of rock-specimens in bore holes, in order that when a specimen is brought to the surface its strata may reveal the direction of the dip. A cord attached to a gyroscopic compass is situated in the upper part of the apparatus. A drilling tool attached to a small motor makes a hole in the rock, and at the same time the cord is worked by a suitable working device. A coring bit is then used to cut out the rock specimen and by means of the marks on the cord and rock the direction of dip may be ascertained. W. H. T.

568. Process of Extracting Oil from Oil-bearing Sands and Similar Materials. Commun. from Jackson Research Corporation. E.P. 237,737, of 6th August.

The earth or sand freshly mined and still soft and moist is crushed and introduced into a vertical retort heated by a furnace and provided with a grating to prevent the contact of the material with its walls, a false bottom, and removable top and bottom for introduction and withdrawal of the material. The material is heated to a temperature sufficient only to vaporise the oil without cracking, that is, between 400° and 425° C. The steam and vapours from the retort are withdrawn to a condenser, and any gas or uncondensed vapours are returned to the retort by a blower, and there pass around and through the whole of the charge, equalising its temperature. The temperature may be adjusted by regulating the speed of the blower. The condensate from the condenser passes to a storage tank, and the excess of gases may be led to a gas-holder. A horizontal retort may also be employed, and the retort may be adapted for continuous operation. H. M.

Coal and Shale.

569. Analysis of the Oil Obtained by "Berginisation" of Low-temperature Coke from Brown Coals. H. Tropsch and W. Ter Nedden. Brennstoff-chemie 6, 143—145 (1925).

An oil was obtained by berginisation of low-temperature coke from brown coals ("Rheinische Braunkohle"; Union Briketts), at 460°, was five or six times birginised with a maximum pressure of 200 to 280 atmospheres. The

oil obtained was distilled out of the hot autoclave. The following result was obtained :—

	Boiling points, °C.	Percents. of the total weight of oil.	Percents. of the low-temperature coke.
Neutral oil	60°–150° ..	8·9 ..	2·4
,, ,, ...	150°–280° ..	38·2 ..	10·3
,, ,, ...	>280° ..	17·5 ..	4·73
,, ,, ...	Residue ..	17·8 ..	4·8
Carbolic acid	181° ..	3·2 ..	0·86
o-Cresol	191° ..	1·5 ..	0·41
m-Cresol	202° ..	1·9 ..	0·52
Phenols	202°–280° ..	7·1 ..	1·91
,, ...	>280° ..	1·7 ..	0·47
Basic substances ..	180°–280° ..	2·2 ..	0·6
		..100·0 ..	27·00

From these results, the authors conclude to the aromatic structure of coal H. I. W.

570. The Hydrogenation of Coals and Specially of Low Temperature Brown Coal-coke by the Method of Bergius. Franz Fischer and Wilhelm Frey Brennstoffchemie **6**, 69 (1925).

Different kinds of coal and of low temperature coke without any addition of oil were hydrogenated by the authors. This method of working has the advantage that the reactions are not so complicated. They proved that on hydrogenation of coal, high percentages of oil are formed. Thus, from low temperature brown coal-coke, 30—40 per cent. of an oil, was obtained which could be distilled. The oils which they obtained on hydrogenation of their different raw materials all contained up to 20 per cent. of phenols. These phenols are not formed from the low temperature tar, for also at the hydrogenation of low temperature coke phenols are formed. A large number of experiments are described in this paper. H. I. W.

571. Process of Distilling Carbonaceous Material Such as Oil-shale. H. Fairbrother. Commun. by Jackson Research Corporation. E.P 236,420 of July 9.

The continuous destructive distillation of the carbonaceous material is carried out by heating to 500° to 600° C. in a fixed vertical retort, which may be of steel, having a perforated bottom, below which is a gas-collecting chamber. The liquids, vapours and gases evolved are withdrawn from the collecting chamber to a gravity separating tank, where the liquid is separated from the gases and vapours. The gases and vapours are passed to a surface condenser in which further vapours condense. The remaining inert gases, free from oil and water vapour, and of low surface tension, are passed back to the top of the retort by a blower, and thence drawn downwards through the material in the retort. The effect of the low vapour tension of the gases is similar to that of a vacuum in that it enables distillation to be effected at temperature much lower than the usual one of 950° C. The low temperature enables steel to be used as the material of the retort instead of cast iron. H. M.

572. Shale-distilling Apparatus. E. W. Hartman. U.S.P. 1,546,659 of July 21.

A retort for shale-distilling comprises vertically spaced annular shelves over which the shale travels, conveyors for moving the shale, actuated by

a central vertical shaft extending through the central openings in the shelves, so that shaft and shelves define an annular space into which the products of distillation pass, and a dome at the top of the retort over the annular space for the collection of the products. H. M.

573. Apparatus for Treating Bituminous Shale. J. H. Ginet. U.S.P. 1,541,135. 9.6.25. Appl., 1.11.20.

A retort for treating shale is fitted with a plurality of shovels adapted to sweep successive zones of the retort. Each shovel deflects material to the zone swept by the next adjacent shovel. T. A. S.

574. Process for Producing Combustible Gases and Coke from Bituminous Fuel. Power-Gas Corporation, Ltd., and N. E. Rambush. E.P. 235,958, 26.6.25.

This invention claims to produce from bituminous fuel a mixed gas, comprising water-gas and coal gas, ammonia, low temperature tar, and a 50 per cent. yield of highly reactive coke, at average lower temperatures than is usual. The operations of gasification are carried out in such a manner that a mass of semi-coke formed in the lower zone of the fuel column is continuously maintained in an easily reactive incandescent state by eliminating the usual down-steaming and by continuously withdrawing coke from the lowest part of the fuel bed at such a rate that the zone of reactivity is not displaced too greatly with up-steaming alone. Bituminous fuel is charged continuously into the upper parts of a shaft generator, air being introduced at the bottom and thereby bringing the semi-coke formed during the process to incandescence and generating "blow gas," which is discharged through an outlet near the middle of the shaft generator. Steam is then introduced at the bottom of the shaft producing water gas. The sensible heat of the water gas is utilised for distilling the fuel in the upper parts of the generator, and the water gas, together with the low-temperature distillation gases, ammonia, and low-temperature tar produced by the distillation are removed through an outlet near the top of the generator. The column of fuel and coke are made to descend continuously throughout the process by removing coke at the bottom. The sensible heat of the gas produced in the incandescent zone is efficiently absorbed by the distilling fuel and outlet temperatures of 100° C. for the mixed gases are obtained. An improved means of removing the coke formed is described, whereby revolving knives cut the coke up and pass it into coke pockets in a revolving table. The coke-removing table is mounted in a revolving hollow pillar shaft through which the air and steam blasts are introduced. Figures of the performance of such an apparatus during long period trials are compared with those obtained by other means and are of interest:—

	Present Invention.	Gas Works Retorts.	Ordinary Bituminous Water-gas Plant.	Water-gas using Coke.
Gas (cu. ft./ton)	29,000	18,000	60,000	60,000
B.T.U.'s/cu. ft.	390	450	335	300
Coke (lbs./ton)	1000	1200	Nil	Nil
Sulphate of ammonia (lbs./ton)	35	25	40	Nil
Tar (galls/ton)	15	12	12	Nil
Thermal efficiency (excluding steam) ..	85·1	82·3	74·3	72

The inventors claim that their plant involves only one-half the capital cost necessary in the case of a gasworks retort. A. W. G.

575. An Improvement in or in Connection with the Carbonisation of Bituminous Coals. J. C. Jolly and R. V. Wheeler. E.P. 236,002, July 2, 1925.

By making use of two thermal properties of anthracite and semi-anthracite coals, namely (a) their stability at temperatures between 15° C. and 600° C., and (b) when heated in the absence of air between 600° C. and 1,000° C., a very high proportion of the total gaseous distillation is hydrogen, the inventors claim to be able to reduce the sulphur content of coke obtained from bituminous coking coals. Bituminous coals is mixed with about a quarter as much by weight of anthracite or semi-anthracite coal containing no more than 1 per cent. of sulphur, and is charged into by-product coking ovens of the usual type, and is carbonised at a temperature of about 1,000° C. The high proportion of hydrogen produced during the distillation reduces sulphur compounds in the bituminous coal, and so governs them in the distillation gases. This invention covers the use of all other materials which, when heated, will produce a high proportion of hydrogen or other reducing gases, and which are thermally stable and inert over the temperature range 400° to 600° C. in relation to the coal under treatment during the process. A. W. G.

Abstracts.

Arranged by W. H. Thomas, A.R.S.M.

Abstractors.—S. F. Birch, Ph.D., D.I.C., A.I.C., S. Bowman, F.I.C., A. Williams-Gardner, B.Sc., J. Ivon Graham, M.A., M.Sc., A.I.C., C. V. Hill, B.Sc., H. Moore, M.Sc., A.I.C., F.C.S., W. S. Norris, Ph.D., D.I.C., A.I.C., R. Pitkethly, G. Sell, T. A. Smith, B.Sc., F.I.C., W. H. Thomas A.R.S.M., H. I. Waterman, Ph.D., and T. Wiskin.

General.

576. Reports on Russian Mining Industries. Petroleum. *Russian Mining Journal*, No. 9-10, p. 758.

Grosny.—Grosny is putting down eccentrics to work deep well pumps in groups. Five of these are now pumping from 7-12 wells each. Until lately these pumps were put into wells with a maximum depth of 300 sag.; but at present experiments are being carried out in deeper wells, the results being fully satisfactory. One doubled 2″ pump is working in a well 468 sag. deep, but one single 3″ pump in a well 422 sag. deep deserves better attention. A very important attainment on the oilfields of a similar unification is the capping of fountain wells with a view to utilising the gases given out, which formerly escaped into the air in overwhelming quantities without utilisation, and which have already begun noticeably to reflect on the technical and economical requirements of the industry in a decreased expenditure of fuel.

T. W.

577. The Water-flooding Problem in Balachany. *Russian Mining Journal*, No. 9-10, p. 759.

As is well known, one of the chief life questions in the struggle with water is the shutting off of the waterlogged wells with a view to preserving those parts of the oil-bearing areas undergoing new development and, in part, those already damaged from further flooding. In practice different conditions are met with, necessitating the application of various processes for such isolation, but in general they amount to the following: The well is cleaned from plugging, and if the casings are collapsed or broken off these are remedied. A wooden plug is then lowered into the casings to a point below where the shut-off is to be carried out. Holes are then drilled on a level with the shutting-off clay strata, and by means of a so-called cage lowered down, a clay solution is, under heavy pressure, pumped through these holes into the back of the casing. This solution, owing to the pressure applied, rises up and fills in the space formed between the shutting-off strata and the casings, thus isolating the water strata from the casings and also from the shutting-off clay strata. Holes are then drilled in the casings above the water horizon, a clay solution being again pumped in under heavy pressure. The work itself, owing to the number and nomenclature of the wells requiring isolation, is very complex, as, besides necessitating an exhaustive knowledge with the programme of water in exploiting new areas, it is dependent on the indispensableness of a thorough acquaintance with the history of each waterlogged well.

T. W.

578. Bibi-Eibat Bay. *Russian Mining Journal*, No. 9-10, p. 759.

The work on Bibi-Eibat bay has taken on the character of detailed prospecting with a decrease in the number of wells, the deepening of which were acknowledged to be non-conformable to prospecting. The work during the latter months was accompanied by the explanation of the influence of two factors: (1) The protracted exploitation on the mainland, and (2) the mud volcano. Drilling has confirmed that the exploitation of the wells on the littoral has considerably weakened the saturations of the shore wells of the bay. Nine wells were drilled through the first five strata, and in neither was there any considerable petroleum discovered. In this district three wells are in exploitation—No. 9 on VII. stratum, No. 10 on VIII., and No. 1 on the XI. stratum. The influence of the mainland exploitation gradually decreases towards the centre of the bay and entirely disappears on the southern slopes. On the other hand, a study of the mud volcano, on the basis of drilling datum, leads to the conclusion that with depth the volcanic breccia in the well decreases, which characterises the volcano as a complicated net of crevices, spreading out bouquet fashion in the upper strata, and decreasing in the depth, the crater of the volcano likewise decreasing. In this manner the breccia wells become normal, which is confirmed by the information that the production of petroleum exclusively from the breccia wells of the bay is satisfactory. T. W.

579. Cable-drilling in Bibi-Eibat. *Russian Mining Journal*, No. 9-10, p. 759.

Endeavouring to evolve a more rational and less expensive method of drilling, Azneft is carrying out experiments in the application of cable-drilling to the local conditions of this district. Well No. 2, over the VII. plot, Bibi-Eibat, drilled to a depth of 300 metres by the percussion system, is now being deepened to a proposed depth of 450 metres with the last column of casing 16″ diam. by means of cable-drilling, the work so far being satisfactory. If the results of this drilling are successful it will be possible to apply cable-drilling to a large number of wells, which promises a great advantage, both in the rapidity of drilling and in the reduction of drilling costs. T. W.

580. Kirmakinsky Wells. *Russian Mining Journal*, No. 9-10, p. 759.

The Kirmakinsky formation, in the limits of the Balachany area, contains a 45-metre thick bed of clay, into which the casing shoe is pressed with a view to preserve the oil strata of this formation from becoming water-flooded. One shoe is pressed 4 ft. into the upper part of this clay, and a second shoe into the lower part, the distance between being 12-15 metres. Thanks to this, it is possible to do without shoe cementation. The experience of well No. 308, having fountained for four years with a daily debit of 100-120 thousands, confirms the rationalism of this method. The Kirmakinsky wells fountain better with a smaller diameter casing (8″), but give out a great deal of clay, which frequently causes plugging, the clearing out of which is very difficult and causes long delays. T. W.

581. The Practice and Approaching Problems of Grosny. U. K. Maksimovitch. *The Petroleum and Oil Shale Journal*, p. 484, No. 9.

The author of the above subject refers in his article to a five years' programme of work for the Grosny oilfields, entered upon in 1923, and divides this programme under four headings:—(1) A further extension of the scale of work of the Grosny oil industry and the enhancement of its productivity in oil winning, drilling, refining, &c. The amount to be won is fixed at 170 million poods yearly with 800 wells, and drilling up to 50 thousand sagenes. (2) The refineries to be expanded so that their capabilities shall

reach the limit arising out of the exploitation programme. (3) A fixed rational plan of the technical economy so that the Grosny industrial technical level shall conform to the heights of foreign technics. In this work are included rational exploitation, drilling, refining, power economy, applying gas as fuel, the utilisation of gas for producing benzine, and other innovations. (4) The commercial side of the five years' programme for Grosny is to realise its products at a profit, which can be done by laying a pipe-line, Grosny—Black Sea, and which measure would secure a free outlet abroad for Grosny petroleum products. A systematical decrease of production costs results from the technical improvements. After analysing the production programme and also the financial plan for Grosny the author makes the following deductions from the general situation:—I. Concerning the technical programme of work: (1) To improve the working of the deposit by means of a more rational development of the petroleum strata. To decrease the production of fountain oil, to increase the number of exploited wells, and the carrying out of general improvement work of the deposits. (2) The further enhancing of drilling work by carrying its centre of gravity on to the old Grosny area, supporting the correlation of production between the old and new areas, co-ordinating the programme of drilling with the principles of successive development of all strata, and the curtailing of drilling on the more productive strata. (3) Concerning the refineries—a further increased output of light products, and the promotion of a new industry in working out highly priced products. (4) To carry out further rational work in drilling and production as well as in refineries. (5) To increase the productiveness of labour. II. Concerning the commercial conditions—(1) To decrease the cost of petroleum as a natural consequence of carrying out rational production. (2) To accelerate the turnover on products, and to enhance the significance of light products in a general rational plan. (3) To lower the price on petroleum products and fuel, especially in conformity with competitive conditions of the interior and exterior markets. (4) To extend credits. (5) To profit rationally by the turnover resources and increased intensiveness of the operating-working capital. (6) To institute a plain and definite Government policy in questions connected with the financial working of Grosny petroleum. The above-mentioned measures form the base of Grosny petroleum work in the ensuing year, and completely accord with those general problems put forward by Grosny in its five years' programme. This circumstance, and also the satisfactory character of the work for the year 1923-24, permit us to state that the ensuing year's programme forms a further step in the successive and systematic development of the Grosny petroleum industry on a definitely fixed plan, the full realisation of which offers no doubt, as the current year's practice has shown this plan to be realisable in life and reality.

T. W.

582. The Detection and Elimination of Odours from Oil Refineries. Robert Spurr Weston. *Ref. and Nat. Gas Manf.*, **4**, No. 7.

The author describes typical refinery practice with particular reference to the source of odours and their discharge into the atmosphere. The main sources of odour are the gases from crude oil, volatile gases evolved in distillation, vapour from heated oil, especially from "cracking" plant, vapours from kilns used to regenerate filter material, the odours resulting from sulphuric acid treatment, emanations from the surfaces separating basins and from the surface of water in gas-holders, vapours from hot coke and stack gases from oil-fired furnaces. The substances included in these vapours are petroleum and asphaltic hydrocarbons, hydrogen sulphide, carbon-bisulphide, sulphur di- and trioxides, pyridin, oxides or carbon, and various volatile compounds of sulphur or sulphur and nitrogen. Some of these substances may be present in the air in sufficient quantity to affect

the health of residents in the neighbourhood of refineries. In 1921 at least 96 persons in the vicinity of Rhode Island refineries had been more or less seriously affected by them. The matters producing the odours may be divided into true gases and vapours. The former diffuse rapidly and the odour roughly varies inversely as the square of the distance, but the latter seem to lose their intensity very slowly with distance, and the distances vary with atmospheric conditions. Map diagrams with various data show the results of observations made of intensity and distance from the source of the odours. The question of control and elimination of the odours is discussed, and suggestions made for their disposal. R. P.

583. Tetraethyl Lead Poison Hazards. Thomas Midgley, jr. *Ind. Eng. Chem.*, 1925, **77**, 827—828.

The chief advantages accruing from the use of lead tetraethyl include conservation of petrol, due to the use of high compression engines, reduction of atmospheric contamination by carbon monoxide formed by incomplete combustion, and reduction in the initial outlay on the engine, etc. Against these advantages the possibility of poisoning by lead tetraethyl must be considered. It is now known that this possibility exists only amongst those actually engaged in manufacturing the pure substance or in handling it in concentrated solution. The dangers encountered in its manufacture are no greater than those existing in many other chemical industries, and even these can be minimised by proper precautions. The chief danger in poisoning by lead tetraethyl lies in the fact that it is a slow rather than active poison and gives little warning until the subject is in a dangerous condition. The actual symptoms differ from those of ordinary lead poisoning, for painter's colic, paralysis and the spasms usual in extreme casse are absent Instead there is a fall in the blood pressure and body temperature, followed in turn by reduced pulse, sleeplessness, and finally delirium tremens. When the patient reaches the sleepless stage he is considered to be in great danger, but before that he can be readily cured by proper treatment. A well-informed physician, however, can easily detect the slightest signs of poisoning, so by careful inspection the danger to workmen can be reduced until negligible. Experiments on animals have also shown that when solutions of lead tetraethyl in spirit in the concentrations usually employed, that is 1 in 1300, are placed on the skin, the lead is eliminated as rapidly as it is absorbed. Similarly the possibility of lead poisoning by dust leaving the exhaust pipe of an engine burning "ethyl gas" has also been shown to be very remote. The only possible source of danger so far discovered is by the regular consumption of bread toasted by the flame of spirit containing lead tetraethyl, which has been found to contain sufficient lead to produce in time the symptoms of painter's colic. S. F. B.

584. Peptisation. A. V. Slater. *Chem. and Ind.*, 1925, **44**, 499 T.

After discussing the widely differing meanings given to the term "peptisation," the author adopts the following definition, based on Graham's use of the word: True peptisation is the transformation of a gel to a sol by addition of a small quantity of a dispersing agent. Peptisation involves chemical action between the colloid and the peptiser. Increased electric charge and lowered interfacial tension are not in themselves sufficient to cause actual dispersion; true solution pressure is also necessary. A substance can be peptised if it is in gel form and if its particles are not above colloidal dimensions. It can be peptised by a substance that is easily adsorbed by reason of primary or secondary valency forces, one part of the peptiser molecule uniting with a part of the colloid molecule to form a non-ionised substance, so suppressing the concentration of the flocculating ion. The colloid particles are drawn into solution by the solution pressure exerted by the peptiser. Ions of low electro-affinity of the same sign of

charge as the colloid, combined with ions of small coagulating power, which increase the potential difference within a wide limit of concentration, will be good peptisers; the peptiser must essentially have a high solution pressure of its own. Substances capable of forming soluble compounds with the colloid in high concentration will peptise easily in low concentration. Raising the temperature and increasing the pressure will enable some substances to peptise a colloid, which at lower temperatures and pressures are unable to overcome the cohesion of the colloid. In case the peptiser does not exert sufficient solution pressure to form eventually a soluble complex salt at high concentrations, the concentration must be kept low to prevent lowering of the potential difference, which causes flocculation. W. S. N.

585. Corrosion of Copper Pipe by Kerosene. E. Staudt. *Chemiker-Zeitung*, 1925, **I35**, 952.

A spiral pipe leading kerosene to the carburettor and heated externally by the exhaust gases was installed on a tractor. About 40 litres of kerosene passed through the pipe daily. After two weeks' running the pipe was found to be filled with a gray-black mass with the exception of a passage 2-3 mm. wide, the walls of the pipe being reduced to 1/10th mm. in thickness. The analysis of the mass was Cu 72·56%, S 20·90%, and C 5·02%, and it contained 1% of copper sulphate. Deducting this, the analysis approximately corresponded to Cu_2S. The kerosene was found to have a sulphur content of 0·104%, and this was abundant in quantity for the formation of the deposit in the time stated. The copper sulphide formed was porous and did not form a protective layer. Copper is, therefore, unsafe as a conduit for petroleum oils when the temperature is elevated. H. M.

586. The Chemistry of Petroleum. Part II. The Action of Sodium Hypochlorite on Sulphur Compounds of the Types Found in Petroleum Distillates. S. F. Birch and W. S. P. G. Norris. *J.C.S.*, 1925, **127**, 1934-1944.

The discrepancies between the results of previous authors as well as the unsuitable types of compounds employed by them have led the authors to investigate the subject anew. They find that, contrary to the statements of Wood, Lowey, and Faragher (*Ind. Eng. Chem.*, 1924, **16**, 1116), a suitably "active" solution of sodium hypochlorite readily oxidises organic sulphides to sulphones, and mercaptans and disulphides to the corresponding sulphonic acids, some sulphuric acid being formed at the same time. A suitably "active" solution is one containing practically no free sodium hydroxide, as the presence of this substance considerably slows up the oxidation of disulphides, although affecting the oxidation of sulphides to a much smaller extent. In the presence of much caustic soda mercaptans are partly oxidised to disulphides, the oxidation of which then proceeds slowly in the manner indicated above. The authors consider that hypochlorous acid is the oxidising agent in hypochlorite solutions, a theory supported by the fact that sodium hypochlorite is much more reactive in dilute solution, whereas the addition of caustic soda, which tends to suppress the formation of the acid, decreases its reactivity. Sodium hypochlorite, even in neutral solution, is without effect on thiophene and free sulphur, but oxidises hydrogen sulphide with the formation of free sulphur and sulphuric acid. S. F. B.

587. Petroleum of El Quemado (Argentina). E. Longobardi. *Anal. asoc. quim. Argentina*, 1924, **11**, 365—368.

The petroleum from El Quemado, Argentina, has the following characteristics: Density at 15° C., 0·960; flash-point, 41°; viscosity (Engler) at 50°,

350·6; sulphur, 0·527%; calorific value (Mahler), 10,719 cal. Fractional distillation gives 4·9% water; 3·4% oil up to 175°; 12% kerosene, up to 300°; 17% lubricating oil up to 360°; and 62·7% asphaltic residue. W. S. N.

588. Unsaturated Hydrocarbons in the Derivatives of Roumanian Petroleum. G. Gane and M. Zilisteanu. *Bulletin Soc. Chim. Roumani*, 1925, **7**, 6—10.

The unsaturation of the fractions obtained when Roumanian petroleum is distilled, as shown by the iodine values, increases with the boiling point of the fraction. This is in part due to cracking, for by cracking the crude oil at 500—550° C., the formation of unsaturated products in the fractions boiling above 170° is comparatively increased. Figures for the iodine values obtained from the six fractions of fifty-one different Roumanian petroleums are given, and from these it would appear that the content of unsaturated compounds increases with geological age. The determination of the iodine values of the oils is greatly facilitated by the use of iodine in 98% alcohol, in which the oils themselves readily dissolve. S. F. B.

589. Action of Aluminium Chloride on Hexahydroaromatic and Saturated Aliphatic Hydrocarbons. R. K. Stratford. *Les Matières Grasses*, 1925, pp. 7294—7297.

Cyclohexane and its alkyl derivatives were heated with aluminium chloride at various temperatures. Cyclohexane and methylcyclohexane, at 145° and 150° respectively, were not altered. Of the dimethylcyclohexanes, at 115—120°, the ortho and para derivatives are (partly) converted into the meta. Ethylcyclohexane, at 115—120°, undergoes conversion into metadimethylcyclohexane. Normal propylcyclohexane and isopropylcyclohexane, at 130—145°, give 1:3:5-trimethylcyclohexane. Proof of these statements is promised in a forthcoming instalment of this article. W. S. N.

589A. Progressive Halogenation of Saturated Acyclic Hydrocarbons. H. Gault. *Les Matières Grasses*, 1925, pp. 7291—7294.

Information from various sources is collected on the further halogenation of dihalogenated, trihalogenated and tetrahalogenated hydrocarbons. The use of iodine chloride, phosphorus chloride, antimony and molybdenum chlorides, aluminium chloride and bromide, and the halides of iron is discussed. W. S. N.

590. Study of the Nitrogen Compounds in Petroleum. J. R. Bailey. *Refiner and Natural Gas Manufacturer*. 1925, **4**, 46, 48, 50, 53, 54 and 56.

The nitrogen content of crude oils varies considerably, Russian, Roumanian and Pennsylvanian oils having only a small percentage of nitrogen compounds, whereas certain Japanese and Californian crudes are comparatively rich. Thus Mabery in one Californian oil found 2·35% nitrogen corresponding to nearly 30% nitrogen compounds. Various authors have examined these compounds and identified pyridine, quinoline, their hydrogenated derivatives, methylamine and ammonium salts, the last probably occurring as salts of the naphthenic acids. The problem of the identification of these compounds is full of difficulties and involves a special technique of a very high order as well as considerable knowledge of microanalysis. The nitrogen compounds present in petroleums form as a whole ill-defined crystalline derivatives with most of the usual reagents for organic bases, and on oxidation with permanganate or dichromate give up their nitrogen, partly as free nitrogen and partly as ammonia. The nitrogen atom is basic and forms quaternary salts with ethyl iodide. The compounds themselves are immiscible with water, but miscible with all the usual organic solvents; in fact, they closely resemble in all their properties the pyridine and quinoline bases. Recently Mabery and Wesson

have isolated a series of nitrogen compounds, extending from $C_{12}H_{17}N$ to $C_{17}H_{21}N$, from Californian petroleum by fractional distillation of the bases obtained from the acid washings, but, owing to the insufficient data obtained by these authors, this work is open to severe criticism. Thus with permanganate each compound gave a number of oxidation products, and of these, one, which was identified as pyridine pentacarboxylic acid, was found to be formed from each fraction. In view of the importance of this discovery and also because the properties of the acid obtained by them differ somewhat from the properties of Hantzsch's pyridine pentacarboxylic acid, it is very unfortunate that no attempt was made to compare the two directly. Again, oxidation with limited permanganate gave them 4-methylpyridine tetracarboxylic acid, and with dichromate an oil which they identified as 3-methyl-picoline by means of its picrate, but no direct comparison was made with the genuine substances prepared synthetically. As a result of their researches Mabery and Wesson conclude that these substances are alkylated quinoline or alkylated hydroquinoline derivatives, deducing, from the fact that in the oxidation no aliphatic acids are formed, that these alkyl groups are small. From the formulæ assigned to the various fractions by Mabery and Wesson, it appears that the less alkylated bases are hydroquinoline derivatives, whereas those possessing larger numbers of alkyl groups are wholly aromatic. Commenting on Mabery and Wesson's work, the present author points out that heptamethylquinoline has very similar analytical figures to the compound $C_{17}H_{21}N$, and also possesses all the properties described for this substance. After criticising the methods employed by them in attempting to separate the constituents of each fraction, the author points out that, should it be possible to separate these substances on a large scale, the pure derivatives would have considerable value as a source of cyanine dyes. S. F. B.

591. Studies in Emulsions. I. Types of Hydrocarbon Oil Emulsions. W. Seifriz. *J. Physical Chem.*, 1925, **29**, 587—595.

Preliminary experiments showed that emulsions of water and kerosene, using casein as stabiliser, are of the oil-in-water type, whereas water and lubricating oil emulsions are of the water-in-oil type. It is therefore to be expected that somewhere between these extremes in the hydrocarbon series, there exists a point at which reversal of type occurs. An examination of the types of emulsions (using casein) which the various petroleum distillates give revealed the following facts:—

Gravity of oil.	Type.
Less than 0·820.	Fine stable oil-in-water.
0·820—0·828.	Coarse unstable oil-in-water.
0·828—0·857.	No emulsion.
0·857—0·869.	Moderately stable water-in-oil.
Above 0·869.	Fine stable water-in-oil.

The relationship between surface tension value and type of emulsion demanded by Bancroft's theory of emulsification does not therefore appear to exist. Similarly the molecular wedge theory of Langmuir and others does not appear to be adequate in its present form, as it demands a monomolecular film or membrane of molecular proportions, whereas the membranes could actually be observed. S. F. B.

591A. Studies in Emulsions. II. Effect of Electrolytes on Petroleum Oil Emulsions. W. Seifriz. *J. Physical Chem.*, 1925, **29**, 595—600.

The behaviour of certain petroleum oil emulsions, stabilised with casein, in the presence of electrolytes, bears no apparent relation to the valency of the ions nor to the surface tension changes between the oil and the aqueous casein occasioned by the electrolytes. S. F. B.

592. THE THERMAL DECOMPOSITION OF PARAFFIN HYDROCARBONS. By A. Williams-Gardner. *Fuel in Science and Practice*, 10, 430—440.

This paper gives a preliminary account of the initial stages of a research, the object of which is to elucidate the nature of the chemical changes involved in "cracking" operations. An historical account of past work on the subject is included.

The present research commences with a study of the thermal decomposition of ethane as being the simplest characteristic member of the series of paraffin hydrocarbons.

Under conditions of pressure slightly below normal, ethane first shows signs of decomposition at 550° C. Decomposition is, however, very slow, and secondary changes are unlikely at this low temperature. The products of decomposition are methane, ethylene and hydrogen; at slightly higher temperatures the ethylene formed shows a tendency to be hydrogenated to methane and to be decomposed to carbon and hydrogen. At no period during the thermal decomposition of ethane is acetylene formed in any appreciable quantity.

Aromatic compounds are formed in quite appreciable amounts, and benzene is found to be one of the chief liquid products. This formation of aromatic bodies is ascribed to the behaviour of ethylene at temperatures in the region of 750° C. At these temperatures secondary changes set in; polymerisation of olefinic bodies occurs with simultaneous elimination of hydrogen. Direct decomposition of ethylene to methane and carbon also appears to take place.

Up to 800° conditions appear to favour the formation of liquid products, but above this temperature there is a strong tendency for direct decomposition of ethane and ethylene to their elements, together with hydrogenation to methane. At still higher temperatures, decomposition of methane to its elements sets in.

The mechanism of the changes occurring are explained on the assumption that there is a scission of the C—C bond in the ethane molecule giving rise to $\cdot CH_3$ residues which are stable at the lower temperatures. With rise in temperature these residues are dissociated to $:CH_2$ residues, which polymerise with similar residues yielding ethylene, or may be decomposed still further to $\vdots CH$. They may also be hydrogenated to methane or may decompose to carbon and hydrogen. The $\vdots CH$ residues polymerise to aromatic compounds. Thus—

$$\mathrm{H{-}\overset{H}{\overset{|}{C}}{-}\overset{H}{\overset{|}{C}}{-}H} \rightleftarrows \cdot CH_3 + CH_3 \rightleftarrows :CH_2 + :CH_2 + H_2 \rightleftarrows C_2H_4$$

Hydrogenation
$$2(\cdot CH_3) + H_2 \rightarrow CH_4$$
$$(:CH_2) + H_2 \rightarrow CH_4$$

Dehydrogenation
$$2(:CH_2) \rightleftarrows 2(\vdots CH) + H_2$$
$$(:CH_2) \rightarrow C + H_2$$
$$2(\vdots CH) \rightarrow 2C + H_2$$

Polymerisation
$$n(\vdots CH) \rightarrow CuHn.$$
$$u(\vdots CH) \rightarrow CuHn{-}m + \frac{m}{2}H_2$$

900° C. and upwards
$$CH_4 \rightleftarrows C + 2H_2$$

The results obtained support the view put forward by Habu, Sharpe and Young and others that pyrolytic behaviour of ethane depends in the first place upon the decomposition of a paraffin to a lower paraffin and an olefine. Subsequent changes are due to secondary decomposition of methane and ethylene, the former being stable at the lower temperatures and yielding carbon and hydrogen at high temperatures, the latter showing first a tendency to polymerise and dehydrogenate, while later suffering disruption of the molecule producing carbon, hydrogen and methane. The

hydrogenating effect of the hydrogen atmosphere produced has an important bearing upon the nature of the changes occurring.

Experimental.

In the first series of experiments a known volume of pure dry ethane was circulated continuously at a known speed and under a known pressure through a heated unpacked tube of glazed Berlin porcelain maintained at a known constant-temperature. The apparatus was closed system, and consisted of a calcium chloride drying tube, a mercury manometer, glass bulb, furnace tube, two condensing tubes, and a Sprengel mercury pump, all in series. The furnace tube and the condenser tubes could be by-passed by an arrangement. All joints were either fused or were composed of ground-glass pieces, which when lubricated and held in position by means of springs made a perfectly airtight fit. The apparatus, when evacuated, could maintain its vacuum for a long period of time without any leakage. The furnace tube was heated by means of a michrome-wire wound electric furnace and could be maintained at any constant temperature for a long period of time. The condenser tubes were kept immersed in ice-cold water during an experiment.

The results of analyses of the gases produced by the treatment of ethane in the above manner for such a length of time that all the ethane was decomposed, or, in the case of the low temperatures, for such a length of time as was practicable, are given below for a range of temperature of from 500° C. to 900° C. In each case 1800 cc. of ethane were circulated at a pressure of between 450 and 550 mm. of mercury at a rate of between 50 and 60 cc. per minute.

Composition of the Gaseous Products.

Temperature (° C.)		500	600	700	800	900
Time of treatment (hours)		5½	7	7	4	4
Percentage composition of the gaseous products	Higher olefines	No decomposition	1·7	2·28	1·83	0·68
	C_2H_2		Nil	0·59	0·96	0·95
	C_2H_4		5·59	13·85	8·44	1·02
	H_2		4·73	24·35	33·23	42·30
	C_2H_6		70·95	37·84	4·96	Nil
	CH_4		17·2	24·34	49·91	56·11

Decomposition of ethane under the above conditions evidently commences slightly below 600° C.; it is completed after two hours' heating at 900° C. Carbon made its appearance in minute quantities at 600° C., but there was no formation of liquid products. A yellow oil made its appearance after 50 minutes' heating of ethane at 700° C.; naphthalene was also formed in crystalline plates. There was a fairly large deposit of fine carbon at this temperature. Decomposition at 800° C. is very rapid, there being a 50 per cent. increase in pressure after one hour's heating. Liquid products are formed immediately at this temperature, together with naphthalene and large quantities of a flaky variety of carbon. No naphthalene was obtained at 900° C., but some red oil condensed in the cooling tubes. Carbon similar to that formed at 800° C. was formed on the walls of the reaction tube.

Curves are given showing the nature of the rise in internal pressure of the system with treatment of the gas at different temperatures. Curves are also given showing the variation of the composition of the gaseous products with rise in temperature. Ethylene was found to increase in quantity up to a temperature of 700° C., after which its proportion in the residual gases decreased. The formation of methane increased after 700° C., and was accompanied by the appearance of liquid products and carbon in large quantities.

As a means of following the decomposition of ethane more closely in the initial stages at various temperatures, a large number of experiments were

run in a special form of the apparatus. Pure ethane was passed into an evacuated furnace tube of glazed Berlin porcelain and maintained at a constant temperature for different lengths of time. Changes in pressure were recorded in the manometer. At the end of a specified period of time the gas in the tube was admitted via an ice-cold condenser into the evacuated bulb, from which samples could be drawn for analysis by means of the Sprengel pump. This was repeated at different temperatures.

After 90 minutes' heating at 500° C. ethane remained undecomposed. At 550° C. there was slight decomposition—5 per cent. of methane, but no hydrogen was found in the resulting gases. After 90 minutes' heating at 600° a small trace of hydrogen was found. These experiments were repeated at temperatures increasing by 50° C., and for lengths of time varying between one minute and one hour. Curves are given showing the nature of the increase of pressure with duration of heating and the proportions of the different gaseous products obtained.

Decomposition at 650° C. was very slow, 53 per cent. of the ethane remaining unchanged after one hour's heating; the final gases contained 23 and 16·6 per cent. respectively of methane and hydrogen after one hour.

As a typical example of the experimental results obtained, those for a temperature of 700° C. are given below:—

Duration of heating (min.)		1	15	30	60
Percentage composition of the final gases ..	C_2H_2	0·49	0·96	0·62	0·29
	Higher olefines	0·93	2·04	2·19	2·21
	C_2H_4 ..	5·21	13·42	10·26	8·94
	C_2H_6 ..	78·86	39·99	18·59	8·80
	CH_4 ..	7·59	35·69	48·89	50·20
	H_2 ..	6·83	8·1(?)	20·83	26·30

At no temperature did acetylene appear in any appreciable quantity Ethylene increased in quantity up to a maximum value, and then decreased with duration of heating. It was found in greatest quantity at 700°, after which it suffered rapid decomposition with the appearance of liquid products and naphthalene in the cooling tube. One hour's continuous heating at 750° C. completely decomposes ethane to methane, hydrogen and carbon for the most part.

A series of experiments was then carried out with larger quantities of ethane in order to find out the quantitative yields of gaseous products, condensible bodies and carbon at different temperatures. Seven litres of pure dry ethane were passed down a vertical unpacked tube of Berlin porcelain, glazed within and without, and maintained at a constant known temperature. The gaseous products passed to a gas holder, where they were measured via condensing tubes immersed in a mixture of solid carbon dioxide and acetone. The apparatus employed is that shown in Fig. VI. The quantities of carbon and condensible products formed were weighed and the gaseous products were analysed in the usual manner. The results of this series of experiments are given below:—

Temperature (° C.)		700	750	800	850	900
Percentage by weight of products	Carbon ..	0·2	0·4	4·5	6	13
	Gases ..	78	75	50	58	60
	Condensibles	6·5	9	27	14	15
	Loss ..	15·3	15·6	18·5	22	12
Percentage composition of the gaseous products	Higher olefines ..	5·64	4·42	0·79	nil	0·74
	C_2H_2 ..	nil	nil	nil	0·39	0·32
	C_2H_4 ..	12·0	19·0	10·69	7·67	3·16
	H_2 ..	47·55	49·03	42·50	41·374	49·44
	CH_4 ..	34·54	27·85	46·30	49 95	46·46
	C_2H_6 ..	nil	nil	nil	nil	nil

Nature of the liquid products..	Naphthalene and benzine compounds	Almost entirely benzene and naphthalene	Benzene naphthalene light red oil	Benzene naphthalene light red oil	Benzene naphthalene and red oil
Nature of carbon found ..	Small quantity of fine powder.	Powdery layer on walls.	Dull flakes on walls.	Brittle flakes of dull carbon.	Brittle flakes of bright carbon.

Benzene and naphthalene were definitely identified amongst the condensible products. A ruby-red picrate of melting-point 191·5° C. was obtained from the tar formed at 900° C., but was not identified. A. W.-G.

593. Colloidal Character of Asphalts. R. E. Kirk and L. H. Reyerson *J. Physical Chem.*, 1925, **29**, 865—871.

The authors have studied the effect of copper sulphate on the colloidal character of Trinidad asphalts. They find that after treatment there is a great increase in the degree of dispersion in carbon disulphide as well as a corresponding increase in the time of settling. The nature of the solvent employed has a considerable effect on the properties of the dispersion, and, working in acetone, carbon disulphide and carbon tetrachloride, it has been found that the dispersion involves two factors, the dispersion of the inorganic and of the organic portions of the asphalts. S. F. B.

594. Manufacture of Hydrogen and Acetylene from Methane or Ethylene, or from Gaseous Mixtures Containing Hydrocarbons of the Methane or Ethylene Series. F. Gros. E.P. 211,125.

The gaseous mixture, *e.g.*, natural gas, methane, or ethylene from coal gas, is passed into a reaction vessel consisting of an annular space between a conical stator and a rotor, both of which have projections arranged spirally, and submitted to an electrical discharge. The gas is then compressed to 1500—2150 lbs., washed to free it from tarry matter, and passed through an absorbent, *e.g.*, acetone, to remove acetylene. Fresh gas is then added to the residual gases, under pressure, and the hydrogen extracted by partial liquefaction of the gaseous mixture. This hydrogen can be used to produce further quantities of methane by the reduction of carbon monoxide or dioxide. By this method 280 cubic metres of acetylene can be obtained from one ton of coal gas. S. F. B.

595. Hydrogen from Steam and Carbon Monoxide. G. L. E. Patart. E.P. 228,153.

In the manufacture of hydrogen from carbon monoxide and steam, the heat of the gases and surplus water vapour leaving the plant is recovered by passing them through a special form of vertical column through which water is continuously circulated. S. F. B.

596. Decolorising Carbon. C. J. Gambel. U.S.P. 1,543,763.

Fibrous rice material, *e.g.*, the hulls, is partly charred and treated with caustic soda solution to remove some of the silica and the resins. Practically all the soda is then removed by washing, and that remaining in the charred material is either neutralised by carbon dioxide or by a low-boiling acid anhydride. Excess of the anhydride is removed by boiling. S. F. B.

597. Stabilised Chlorinated Lime. H. P. Cady. U.S.P. 1,545,394.

Bleaching powders may be stabilised by the addition of sodium carbonate and petroleum oil. S. F. B.

598. Acid Sludge Concentration. J. B. Edwards and F. E. Faulkner. U.S.P. 1,539,246.

Sludge acid from petroleum refining is concentrated by allowing it to flow under the action of gravity, with agitation, through a series of hot shallow pans and then through a horizontal pipe, without agitation, heated in a furnace chamber. This pipe is fitted with outlets to allow the vapours to escape. S. F. B.

599. Treatment of Materials (e.g., Active Charcoal) Having a Large Surface. E. Berl. G.P. 411,953.

The spontaneous ignition or oxidation of adsorbed substances by oxygen, condensed in the charcoal, may be prevented by impregnating it with very small amounts of tin compounds, sugar, glycerol, mannitol, or other polyhydric alcohols. S. F. B.

600. Making *Iso*propyl Chloride. G. O. Curme, jr. U.S.P. 1,545,742.

Anhydrous propylene is mixed with hydrogen chloride at 15 atmospheres pressure with or without the addition of a solvent. S. F. B.

601. Evaporation of Volatile Liquids from Tanks. Process for Diminishing. S. G. Cantacuzène. Brit. Pat. 134,798. Conv. (Rumania), 31.5.24. E.P. 234,801. Conv. (Roumania), 2.6.24.

The tank is first covered with a coating of an oil paint and, when this is dry, a layer of a drying agent. Before the second coat dries off, a layer of granular material, such as dried sand, is projected on to the still liquid surface. When this is hard a coating of milk of lime is applied. In the second patent, the layer of granular material is replaced by granular or filamentous material of greater insulating value. G. S.

602. Ethylene Glycol (Prestone) Ideal Anti-Freeze (for Radiators). G. O. Curme, jr., and C. O. Young. *Petroleum Age*, 1925, **16**, 54—57.

As a result of extended research and development, ethylene glycol is now being produced in sufficient quantity and at sufficiently low cost to allow of its general use in car radiators as an "anti-freeze." For this purpose it appears to be ideal; it has a high boiling-point, 197° C., is miscible in all proportions with water, and depresses the freezing-point of it very considerably. Thus a 60% solution of ethylene glycol in water melts at −49° C., but more concentrated solutions melt higher as the freezing-point of the pure glycol is −11·6° C. It is without action on metals, but softens rubber slightly without decreasing its mechanical strength. S. F. B.

603. Factors Influencing Carbon Formation in Automobile Engines. J. W. Orelup and O. I. Lee. *Ind. Eng. Chem.*, 1925, **17**, 731—735.

Cylinder carbon does not consist of elementary carbon as usually imagined, but chiefly of highly condensed hydrocarbons, bituminous in nature, together with mineral matter containing a number of common elements. This mineral matter forms from 6—25% of the deposit according to the conditions of formation, and is chiefly composed of iron oxide, but also contains silicates, chlorides, and sulphates; it is derived from road dust which passes through the carburettor, etc. "Carbon" is practically insoluble in most organic solvents, but the most effective solvents for the deposit are chlorbenzene, xylene, cymidine, and, to a lesser degree, pyridine. The

deposit has the property in common with asphalts of forming dark soluble products with caustic soda solution, indicating a weakly acidic nature. The chief factor influencing the formation of the carbon appears to be the quantity of lubricating oil which enters the combustion space. Other factors are the type of oil employed, temperature, and time. Under the ideal conditions of running it is practically impossible to avoid this access of lubricating oil to the combustion space, and under the usual conditions it amounts to nearly one per cent. of the fuel used. The quantity leaking past the piston is determined by the temperature of the cylinder walls, the load on the engine, the air temperature, and also the fuel-to-air ratio.

S. F. B.

604. Alcohol Good Motor Fuel. By Freeland and Harry. *Petroleum Age*, 1.8.25.

The authors point out that the bulk of the alcohol fuel consumed to-day is used in internal-combustion engines designed to run on gasoline or kerosene. Alcohol containing 10 to 15 per cent. of gasoline and 0·5 to 0·75 per cent. pyridine or aniline may be used satisfactorily without any radical alteration in the carburettor. The function of the pyridine is to prevent the formation of acid products which cause corrosion in the engine, and the use of highly concentrated alcohol also tends to eliminate the corrosive effect. Before changing over from gasoline to alcohol, the whole machine should be thoroughly cleaned, since some gasolines deposit resins, which are dissolved by the alcohol and carried through into the carburettor, where they choke the jet. The float, if made of cork, should be replaced by metal or coated with a substance insoluble in alcohol; a larger jet should be fitted. The fuel consumption of an automobile with alcohol is some 50% greater than with gasoline, and much less air is required. Also the engine is less flexible at slow speeds. But with careful operation, very satisfactory results may be obtained. Alcohol can be used much more successfully in tractors and other engines running at almost constant speeds. In such cases 1% of gasoline or kerosene and 0·5% pyridine mixed with the alcohol will give an excellent fuel, which will show a consumption only 33·3% in excess of gasoline. A slight advance of ignition is advantageous and the air need not be preheated.

C. V. H.

605. The Detonation of Gasoline and Liquid Chlorine Mixtures. B. T. Brooks. *Ind. Eng. Chem.*, 1925, **17**, 752—753.

An account of an accident which occurred at the natural gas gasoline plant of the Phillips Petroleum Company, and which was probably due to the habit, prevalent in certain American refineries, of washing out the chlorine delivery pipe with gasoline to avoid corrosion. Previous to the accident a chlorine cylinder appears to have been opened when this line was filled with gasoline, the result being that the gasoline was forced into the cylinder, where, after a short interval, a violent explosion occurred. To test the possibility of this theory the author forced gasoline into an inverted partly filled chlorine cylinder which was slightly warmed in order to hasten any action which might occur. On examining a pressure gauge attached to the cylinder it was found that the pressure slowly rose after the introduction of the gasoline until the needle was observed to suddenly swing off the scale, when the cylinder exploded with terrific violence.

S. F. B.

606. Liquid Fuel Development in Germany. *Petroleum Times*, Aug. 22nd-25th, p. 304.

A great deal of attention is being paid in Germany to the production of liquid fuels from coal. The German Government has agreed to subsidise

the testing of the Bergius process of liquefying coal, and the expenditure sanctioned indicates the probability of commercial success for the process. The low-temperature carbonisation of coal and other low grade solid fuels is being investigated thoroughly with a view to producing liquid fuels of a marketable value. Synthetic alcohol, produced by the interaction of one volume of carbon monoxide with two volumes of hydrogen under pressure and at about 400° C. in the presence of catalysts, has been exported to the United States in quantities sufficiently large as to cause an outcry in that country for tariff protection. Synthol appears to be a valuable constituent of motor spirits in quantities up to 25 per cent. Methanol has so far found use in industry other than as a liquid fuel. As water gas is produced from the carbonisation products of coal, it is quite possible that the two methods will be worked together in the efficient utilisation of coal, leaving nothing but ash—for which a commercial use may yet be found.

A. W.-G.

607. Improved Alcoholic Fuel. R. De Sarigny. E.P. 238,818. 8.4.25.

The fuel consists of 68—74 per cent. overproof alcohol denatured by the addition of up to 1 per cent. of tetra-hydronaphthalene and dekahydronaphthalene.

T. A. S.

608. Manufacture of Liquid Fuel. E. A. Prudhomme. E.P. 238,931. 23.5.24.

Liquid fuels of the nature of petrol and benzol are prepared by passing water gas mixed with gases rich in hydrocarbons, particularly those of the acetylene series, over a hydrogenating catalyst, then over a dehydrogenating catalyst, and finally over catalysts which will cause polymerisation. The necessary addition of hydrocarbons can be obtained by treating in the gas producer, fuels which are rich in volatile materials, such as lignites; or hot gas from a producer may be passed through heated lignite, whereby low temperature distillation is produced and the gas becomes enriched. The gas is purified by passing it through Laming's mixture, then passed through pumice containing nickel heated to 180—200°. Considerable quantities of methane are produced in this reaction. The mixture is then passed over pumice impregnated with nickel and vanadium heated to 200—230°. The methane is here dehydrogenated, giving acelylene and hydrogen. The gas mixture is then passed over pumice charged with nickel and cobalt at 180°, whereby polymerisation is produced and the products can be condensed.

T. A. S.

609. Fuel for Internal-combustion Engines. J. D. Reidel. A.-G. G.P. 405,750.

Methyl-*cyclo*hexane and dimethyl-*cyclo*hexane may be mixed with the usual fuels or with such substances as solvent naphtha, amyl acetate or *cyclo*hexanol, which on account of their high boiling-point are unsuitable for fuels by themselves, to form fuels for internal-combustion engines.

S. F. B.

610. Improvements in or Relating to Apparatus for the Continuous Measurement of Combustible Ingredients in Waste Gases from Furnaces and Internal-combustion Engines. Siemens & Halske Aktiengesellschaft. E.P. 225,210. July 23rd, 1925.

Waste gases undergo combustion by means of an electrically heated, catalytically acting platinum or platinum alloy wire forming a part of a Wheatstone bridge, and the increase in electrical resistance of said wire caused by the heat of combustion is continuously measured and recorded.

A. W.-G.

REFINING.

611. OPERATES TUBE STILLS ON BRADFORD CRUDE; ELIMINATES RE-RUNNING. By Paul Truesdell. *National Petroleum News*, Vol. XVII., No. 21, May 27th, 1925, page 74.

For the past 18 months Mr. Alexander Lackman, of the Emery Manufacturing Co., has been distilling a Pennsylvania crude in two tube still installations designed and built by himself. He takes 3 cuts—light gasoline, heavy naphtha, and kerosene—and the fractionation is so good that no re-running is required. The process is a discontinuous one. Each of the two units consists of a tube still connected to a 1200 bbl. shell still, the latter being fitted with a 12-inch vapour line to tower, condenser and separator. The oil is charged into the shell still and is then pumped through the tube still, entering at the bottom, where the coolest furnace gases are met, and passing out at the top, where it is subjected to the temperature of the hottest gases. The heated oil returns to the shell still, where it mixes with the body of cold oil and gradually raises the temperature of the whole. Repeated circulation is relied upon to heat the oil in the shell still, and no attempt is made to vaporise a large precentage of oil in the tubes; indeed, Mr. Lackman stresses the importance of keeping the tube temperature down so that it takes about 3 hours to raise the oil to the temperature at which vapours commence to come over (150° F.). In order to achieve this, the speed of the oil in the tubes is kept as high as 6 feet per second, a velocity high enough to ensure that no cracking of the oil or choking of the tubes can occur. The hot oil from the tubes re-enters the shell still through a perforated pipe at the bottom. This mode of entry causes the hot oil to rise in small bubbles through a mass of the oil, which thus exercises a scrubbing effect. The vapours pass out through a 12-inch line to a tower containing air-cooled drums and trays, which effectively separate the light and heavy constituents. At a predetermined stage of the distillation, steam at 40lb. pressure is introduced into the shell still in the normal way. The tail house is fitted with recording thermometers and pressure gauges which show the conditions existing throughout the system. The normal pressure—caused by the pump—is 10 to 12lb., and any increase would indicate the choking of the tubes, whereupon the furnace would be shut down. This has never occurred in 18 months. All uncondensed gas is passed through 3 horizontal tanks of 150 bbl. capacity, each charged with 100 bbl. of heavy naphtha which extracts the gasoline content. The dry gas is then burned in the furnace. It is claimed that in this method of distillation the thermal conditions are such that the residue is quite uncracked, so that lubricating oils may be obtained without difficulty. C. V. H.

612. DESULPHURISATION OF PETROLEUM OILS. E. H. Nozano. *Quim. e. ind.*, 1925, **2**, 92.

Concentrated nitric acid has been found to give good results. The organic sulphur compounds are oxidised to sulphur dioxide and the asphalts and higher aromatic substances precipitated, the latter as nitro-bodies. Subsequent treatment with alkali and magnesium neutralises the excess of sulphur dioxide, reduces the nitro-compounds and dissolves the resin.
S. F. B.

613. MCCLAVE PROCESS FOR THE RECOVERY OF OIL FROM BITUMINOUS SANDS. *Petroleum World*. Vol. XXII., No. 299, August, 1925.

The process consists in digesting the crude sand in a 2% to 3% solution of Bentonite in water at 15° to 200° F. The mass is then screened to remove coarse gravel, and water is added until the mixture consists of 1 part sand to 5 parts water. This mixture is passed through an oil flotation separator.

The product is a heavy viscous emulsion which is separated in a centrifuge, and the resulting heavy oil is passed through a continuous retort, which removes any volatile constituent and delivers a finished asphalt ready for the market. The volatile constituents are condensed into a crude oil, which is refined by the usual methods. C. V. H.

614. Recovery of Sodium Plumbite in the Oil Industry. A. Kinsel. *Chem. Met Eng.*, 1925, **32**, 873—874.

Hitherto, in the treatment of sour distillates by plumbite, the lead sulphide formed has been discarded as unrecoverable. By using sludge acid, itself a waste product, it has been found possible to recover 99% of the lead and from 75—80% of the caustic soda. The process is as follows:—The lead sulphide is separated from the spent plumbite and dewatered as far as possible. It is then mixed with sludge acid, diluted to 35—40° Bé., and allowed to stand, when the lead sulphide is converted into lead sulphate. After washing free from acid, the sulphate is treated with caustic soda, the following reaction occurring:—$PbSO_4+3NaOH=Pb(OH)ONa+Na_2SO_4+H_2O$. The chief advantages claimed for the method, besides the recovery of lead and soda, include use of sludge acid, recovery of gasoline drawn off with the lead sulphide, saving on labour cost in handling soda drums, greater solubility of the lead sulphate as compared with litharge in soda, and finally elimination of lead-poisoning dangers. S. F. B.

615. Dephlegmator. S. J. Dickens. U.S.P. 1,549,068. Aug. 11th, 1925.

A series of sections containing parallel corrugated plates standing vertically, the plates of each section being at 90° to those in the next. The condensate is allowed to spread over the surface of the plates, above which are water-cooled surfaces. Distillate of low boiling-point is drawn off the top of the dephlegmator, and condensed liquid of high boiling-point is drawn off the bottom. A. W.-G.

616. Still for Hydrocarbon Distillation. Francis M. Hess. U.S. Pat. 1,552,698. Sept. 8th, 1925.

Crude oil is allowed to gravitate in thin layers over a zigzag plate arrangement of hot tubes in W-form, each plate of tubes being covered by a mat or tray of finely divided catalyst. The heating agent (superheated steam) is passed upwards through the tubes in a zigzag course. Another similar zigzag multiple tube conduit conveys hot residues upwards as a second heating agent, under the force of the internal pressure of the system. The incoming crude oil is preheated by outgoing residuum and vapour. A. W.-G.

617. Oil and Water. Means for Separating. M. S. Gibb. E.P. 237,768.

Oil-water mixture is introduced at the bottom of a vertical cylindrical chamber, which is provided internally with a steam coil. The separated water is drawn off from the bottom and the clean oil from the top of the chamber. G. S.

618. Improvements in or Relating to the Purifying of Oils and Other Liquids by Bauxite or Other Adsorbents. F. G. P. Remfry and A. E. Dunstan. E.P. 236,263. June 25, 1925.

Method of testing the efficiency of adsorbents for purifying and decolorising liquids by measuring the temperature effect of mixing a known quantity of the one with a known quantity of the other. A. W.-G.

619. Process for Treating Petroleum Emulsions. W. S. Barnickel. U.S.P. 1,555,818

Petroleum emulsions are broken by the addition of 0·01% to 1% of a resin, resin acid, or oleo-resin, or a derivative of a resin in which substitution of the hydrocarbon radicle has been effected, with or without the simultaneous or subsequent application of heat. W. S. N.

620. Refining of Liquid Hydrocarbons. A. E. Dunstan. U.S.P. 1,552,830.

The liquid hydrocarbon is treated with an alkaline hypochlorite solution and then with a solution of caustic alkali. The residual caustic alkali solution is then used for treating a second batch of hydrocarbon, prior to treatment with hypochlorite. W. S. N.

621. Apparatus for Treating Oil. L. C. Huff. U.S.P. 1,555,976.

Crude or raw oil is fed into the top of a dephlegmator, in which it is preheated by the rising vapours, at the same time acting as refluxing medium. The run-back from the bottom of the dephlegmator is delivered by a pump to a heating coil, a by-pass to the pump, controlled by valves, being provided. Should the pump fail, it is provided that the oil should automatically be passed direct to the heating coil. The vapours from the latter are partly condensed in an expansion chamber from which the condensate is drawn off, uncondensed vapour passing to the bottom of the dephlegmator. The vapour from the top of the dephlegmator is condensed in a water-cooled coil. W. S. N.

622. Refining or Separating Volatile Materials. H. M. Lamy-Torrilhon. E.P. 214,273, 12.4.24. Conv. (Fr.), 12.4.23.

Heat economy is effected during distillation or steam treatment by recovering the heat of steam or vapours formed in multiple effect evaporating or heating apparatus. Vacuum is applied to apparatus by means of steam ejectors working in series. The steam from the ejectors passes through a heater where more water is vaporised under reduced pressure. The steam raised is used to treat a descending stream of oil in a tower containing perforated plates. Condensation of the vapours produced is carried out in a barometric condenser. T. A. S.

623. Bituminous Binding Materials. L. S. van Westrum. E.P. 233,371, 8.11.23.

A bituminous waterproofing soap is prepared by saponifying a drying oil, preferably linseed oil, mixed with asphalt, by an alkali. Bitumen 30 to 50 pts. is mixed hot with resin 3 to 8 parts, and linseed oil 3 to 8 pts. Alkali lye (1 pt. alkali to 3 pts. water) is added until saponification occurs. T. A. S.

624. Bituminous Emulsions. H. A. Mackay. E.P. 233,430, 8.2.24.

A bituminous emulsion miscible with water is prepared by mixing with hot bitumen about 5 per cent. of an emulsifying agent containing cholesterol and adding hot water to the mixture. Wool fat is a suitable emulsifying agent. The emulsion can be used in road-making, briquet manufacture, etc. T. A. S.

625. Deodorising Kerosene. W. Kritshecsky and H. C. Prutsman, Assr. to W. Citron. U.S.P. 1,538,287, 19.5.25. Appl., 2.7.24.

Kerosene is washed with chlorsulphonic acid. It is then treated with alkali and finally with a solid absorbent colloid. T. A. S.

626. Recovering Volatile Liquids from Gaseous Mixtures by Adsorption. C. Mangold and R. Defris. G.P. 411,636.

An apparatus is described consisting of a series of adsorption vessels connected to a common condenser and receiver, in which each adsorption vessel can be connected in the circuit either before or after the condensing system. The gaseous mixture to be treated is passed over the adsorbent in the adsorption vessel, where it expels the adsorbed liquid, and then into the condensing system. The gases from the latter are passed through further adsorption vessels, which in turn are freed from adsorbed liquid by the original gaseous mixture. S. F. B.

627. Recovery of Volatile Solvents. J. H. Bregeat. E.P. 232,843.

*Cyclo*hexanol and methyl*cyclo*hexanols may be added to liquids used in scrubbing vapours containing volatile solvents to aid absorption.
S. F. B.

628. Oil Purification. L. H. Clarke, Assr. to Sharples Specialty Co. U.S.P. 1,553,141, 8.9.25. Appl., 29.11.24.

Oil containing finely divided carbon is purified by dispersing in it an alkaline reagent sufficiently dilute for water soluble impurities, and products of any reaction will be removed in the aqueous phase. The mixture is then centrifuged. T. A. S.

629. Method of Treating Oil. F. W. Manning, Assr. to Manning Equipment Corpn. U.S.P. 1,552,072, 1.9.25. Appl., 16.6.22.

Oil is mixed with freshly roasted, hot absorbent earth, and passed through a rotary filter under pressure. Oil contained in the filtering medium is removed by washing with fresh oil, this oil being again treated with finely divided earth. After steaming the earth is recovered by roasting.
T. A. S.

630. Removing Asphaltis and Ozokerite-like Substances from Hydrocarbon Mixtures. H. Neumann. U.S.P. 1,545,440.

Hydrocarbon oils which contain asphaltic and ozokerite-like substances are heated and treated with an aqueous solution containing tervalent iron and chlorine iron, e.g., ferric chloride solution. The mixture is allowed to settle and forms an aqueous and oily layer. The latter is cooled to remove the ozokerite-like substances. S. F. B.

631. Process and Apparatus for Dehydrating Emulsified Oils. G. Egloff and H. P. Benner, Assrs. to Universal Oil Products Co. U.S.P. 1,559,035.

Heated emulsified petroleum oil is passed through a series of spaced perforated plates, with perforations of decreasing size, under pressure, while subjected to the action of an electric current. H. M.

632. Process and Apparatus for Dehydration of Oil. G. Egloff and J. C. Morrell, Assrs. to Universal Oil Products Co. U.S.P. 1,559,036.

A medium adapted to improve the conductivity is dissolved in the oil and water, and an electric current passed through to effect separation, permitting the water to separate from the oil in a settling stage. H. M.

633. Oil Still. George J. Burns. U.S.P. 1,527,836.

The still is divided into two portions—a lower heating chamber and an upper condensing chamber. The lower chamber is surrounded by a steam jacket. A hollow tube passes vertically through the apparatus and serves as a means of feeding the liquid into the still. The tube is pierced with

small holes at intervals up its length, and opposite these holes are hollow arms carried on an outer tube which is free to rotate. In this way the feed liquid can be passed up the central tube, though the small apertures into the still via the rotating arms which serve to agitate the liquid in the still. Other liquids may be fed into the still in this way, e.g., a neutralising liquid The heat of the steam jacket vaporises the oil in the lower half of the still, and the vapours pass through trapped orifices into the upper or condensing half, where they meet a cooling coil and flow out, as liquid, through a side tube. C. V. H.

634. Preheater for Stills. H. A. Hills. U.S.P. 1,552,433.

Steam, after having passed through the coils in a still used for purifying gasoline, etc., is fed into the annular space between the intake pipe for the dirty oil and a surrounding jacket. G. S.

635. Evaporator. S. T. Smith. U.S.P. 1,556,132.

An apparatus for fractionating a mixture of natural gas gasoline and an absorbent oil. Superimposed sections of the evaporator are separated by plates, each of which bears a number of bosses; vertically through each boss there is a hole, over which a cup, with notched edge, is placed. Beneath each hole is suspended a distributor pan having a plurality of holes in the bottom from which liquid drips on to a heating coil. The mixture to be evaporated is introduced into the top section, the gasoline vapour is pumped off the top section, the residue is run off the bottom section. W. S. N.

636. Process for Condensing Vapours. Edward W. Isom and John E. Bell. U.S.P. 1,558,811.

The vapours from the pressure still are cooled and condensed by injecting them into a body of liquid of the same general composition as themselves. The liquid body is cooled by circulating the oil in indirect heat-exchanging relation with a cooling medium, such as oil or water. A plurality of these condensers may be used to yield different fractions of the distillate. R. P.

637 Oil Heater. John E. Bell. U.S.P. 1,548,343.

A combination of a heating chamber divided into two compartments, each containing banks of long horizontal tubes supported by transverse bridge walls and cantilever rods embedded in the front and rear walls of the two parts of the chamber. A. W.-G.

638. Fluxing Oil. Wm. M. Burton. U.S.P. 1,553,847.

Patenting the production and use of a cracking product for use in fluxing asphalts. Thin fluxing oil has an Engler viscosity of about 6 at 212° F., and a specific gravity of about 1·06 at 60° F. A. W.-G.

Analysis.

639. Determination of Sulphur in Petroleum and its Products. J. Heslinga. *Chemisch Weekblad*, **22**, 98 (1925).

The sulphur in gasoline and kerosene is very easily determined by the oil lamp method [compare Technical Paper 323 A, Bureau of Mines, Washington, 1924, p. 81 (sulphur in burning oils)]. Time can be saved by the hydrogenation method of ter Meulen (*Rec. trav. chim.*, **41**, 62 (1922)), which gives good results with gas oils, fuel oils and lubricating oils of low spec. gr. This method, however, gives difficulties when applied to fuel oils of higher spec. gr. and on asphalts. Heslinga tried to analyse the last-mentioned pro-

ducts by combustion. First he volatises the oil in a red-hot quartz tube in which some pieces of quartz are used as a contact substance. To obtain a complete combustion it is necessary to use a rapid stream of air. The oil vapours by suction mixed with an excess of air come in contact with the quartz pieces and are burnt completely; the sulphur is oxidised quantitatively to SO_2, which is washed by a 3% solution of H_2O_2 and determined by titration. This method of analysis gives good results for all petroleum products, including asphalt and coke. Heslinga, however, prefers to analyse gasoline and kerosene by the ordinary lamp method. The new method f.i. was applied on Mexican gas oil, different kinds of fuel oil, Spramex Panuco, Shelfalt Panuco, Asphalt Panuco and lubricating oil. H. I. W.

640. A.S.T.M. Pour Test. *Oil Trade Journ.*, 1925, Vol. 16, No. 11, p. 16.

Considerable criticism has been directed against the A.S.T.M. Pour Test by the American National Petroleum Association, on the grounds that this test is unfair to Pennsylvania oils in particular and to paraffin base oils generally. Under the conditions of this test, it is stated that this class of oil shows apparent setting phenomena at a temperature considerably higher than the actual set point, and, furthermore, the results are not reproducible. It is alleged that this illusory set is caused by the sudden cooling of the oil from 90° F. to 15° or 20° F. below the set point, and if the cooling was carried out more gradually the results would be nearer the true setting point. Evidence was given to show that in some cases the Pour Point as determined by the A.S.T.M. method was actually higher than the room temperature at which the oil easily flowed from the bottle. Representations are being made to have the test modified. S. B.

641. Analysis of a Mixture of Aniline and Toluidines. H. F. Liddell. *Chem. and Ind.*, 1925, **44**, 506 T.

The method is applicable to an aqueous solution containing 10—20 gm. mixed amines per litre. A portion of the solution is acidified and titrated with N/2 sodium nitrite, keeping the temperature below 5°. A smaller portion of the same solution is mixed with 45% hydrobromic acid and titrated with potassium bromate, using, if desired, starch-iodide paper as external indicator. Then x (=gm. aniline per litre) = $0{\cdot}58125b - 2{\cdot}6957a$, and z (=gm. toluidines per litre) = $4{\cdot}6522a - 0{\cdot}66875b$, where a = gm. sodium nitrite used per litre, b = gm. bromine used per litre. W. S. N.

Lubricating Oil and Wax.

642. Process of Refining Mineral Oil. Harold T. Maitland. U.S.P. No. 1,533,325.

This is a continuous method of acid treating lubricating oil stock. The stock is made by distillation, keeping the temperature as low as possible and cooling the oil rapidly. Before treatment the oil is freed from moisture by a preliminary acid treatment, using just sufficient acid to dehydrate the oil. The dry oil is then blown with air into a foam, which is led through a pipe or chamber into which acid is injected. The mixture of foam and acid is then caused to flow through a tank containing baffle plates so arranged as to provide a circuitous course; the mixture is subjected to further air agitation during its passage through the tank. By this method of treatment the acid tar is a freely flowing liquid which is continuously separated from the oil by centrifuges. It is claimed that this process has a material advantage over other methods of treatment as regards the colour of the finished product. C. V. H.

643. Purification of Crude Montan Wax Distillates. E. Jena. G.P. 411,541.

The distillates are treated with acetone to remove colouring matter and decomposition products and, after distillation to remove the remainder of the acetone, are further purified by treatment with a decolorising powder. S. F. B.

644. Bleaching Crude Montan Wax. E. Jena. G.P. 411,542.

The consumption of bleaching agent and its effect are greatly improved if the resinous constituents are removed from the crude wax before it is bleached by treatment with an oxidising agent. Suitable oxidising agents include air, chlorine and nitric acid. S. F. B.

645. Purifying Lubricating Oils. J. Dreyfus. E.P. 228,162.

Suitable mixtures for purifying lubricating oils for internal-combustion engines contain besides adsorbent materials, such as fuller's earth or finely powdered brick, salts of acids of "high valency." Potassium aluminium sulphates, other sulphates and phosphates, tellurates, selenates, antimoniates and arsenates are examples of these salts. S. F. B.

646. Measurements of Friction with Lubrication. Paul Woog. *Compt. rend.*, 1925, **180**, 1824—1826.

An apparatus is described for measuring the friction caused by the application of pressure on a slowly rotating disc, using oils as lubricants. Surfaces of soft steel and hard calcium are employed, the pressure being applied to the disc by means of a brake which automatically registers the pressure applied. In order to obtain comparable results a special technique is necessary. Results obtained with increasing temperatures show that with all oils the lubrication decreases, but with fatty acids present this decrease commences at higher temperatures. S. F. B.

647. A Process of Increasing the Viscosity of Oils. E. H. Gollinger. E.P 215,334.

The object of the invention is to provide a process whereby fatty oils are reduced to a highly viscous state, in which they are still soluble in mineral oils. The fatty oil is partly oxidised by air blowing until a viscosity of about 50 degrees Engler at 100° C. is obtained. The air supply is then cut off, and the oil heated to a temperature of between 195° to 200° C. The heating may be carried out *in vacuo* or at ordinary pressures, there being no need to exclude air during the heat treatment. The product is an extremely viscous oil suitable for blending purposes. W. H. T.

Cracking.

648. Accounting System for a Refinery with a Cracking System. F. J. Omo. *Ref. and Nat. Gas Manf.* **4**, No. 7.

The system outlined in this article was worked out for an operator who desired to have a complete set of books kept in the main office, allowing the plant proper to keep such accounts and books as were necessary in the operation of the plant. The books contained a complete cost system on the operations of the plant, taking into account such overhead charges and general expenses as were necessary, in order to keep the superintendent informed at all times of the cost of each step of manufacture and whether or not he was overstepping a predetermined economical limit. The article is non-technical. R. P.

649. How Skimming and Cracking Plant Cut Fuel Cost and Increased Yield. Paul Truesdell. *Nat. Petr. News.*, XVII., 43.

The cracking plant consisted of four early standard type units of the Dubbs process designed to crack fuel oil. It was decided that better results

could be obtained by using gas oil, but the distillation plant could not produce sufficient gas oil to keep four units running. One Dubbs unit was, therefore, turned to use as a pipe still, and through this still the bottoms from the crude distillation pass. The throughput amounts to 1600 barrels per day, yielding 70 to 75 per cent. of gas oil, and the residue is saleable as fuel oil. The reaction chamber of the plant serves as an evaporator, and a considerable amount of coke forms in this chamber even when operated at atmospheric pressure. It is explained that it would be less expensive to put in a pipe still to reduce the fuel initially, but under the circumstances the use of the cracker is justifying itself by results. Taking the gas oil off in a topping still before it goes to the cracking plant greatly lengthens the runs because much of the coke is removed in the reducing still. R. P.

650. The Jenkins Cracking Process. *Petr. Times*, XIV., 352.

Experimental work on the Jenkins process under refinery conditions started in 1916, but many improvements have been made and the latest development is the standard unit. The feature of the standard unit is that the cracked gasoline is refined within the unit itself, giving a water white product of export specification without rerunning and requiring only the usual doctor treatment. For ordinary runs producing 190° C. E.P. gasoline a temperature of 400° C. and 110 lb. pressure are the working conditions, but these may be varied to produce any desired product. The still is composed of a longitudinal drum connected to transverse header drums by sluiceways. The header drums are connected to each other by a bank of short tubes which are situated in the furnace. The entire charge is kept in rapid circulation through the tubes, and as cracking proceeds the small amount of carbon formed is continuously removed from the still. Due to a special treatment, this carbon is held in suspension in a colloidal form and is soft and friable, at no time adhering to the still or forming coke. This free carbon, together with any uncracked residue, is removed from the system and discharged into an expander where pressure is released. The portion which vaporises passes through a condenser and is returned with recycle stock from the bubble tower. The products from gas oil and recycle stock are 28 per cent. of 225° C. E.P. gasoline, 15 per cent. fuel oil, and 53·4 per cent recycle oil. The gas loss amounted to 2·8 per cent. and cracking loss 0·8 per cent. R. P.

651. Medium for Bleaching, Cracking, and Desulphurising Petroleum and Other Hydrocarbon Compounds and Process of Preparing Same. Herman Reinbold and Hugo Reinbold. U.S.Ps. 1,558,631/2.

(1) An oil-treating medium comprising hydrous silicic acid in combination with lithium chloride. The use of lithium chloride in an oil-treating medium. (2) An oil-treating medium comprising lithium chloride combined with aluminium chloride. The process of preparing a medium for refining and distilling oils comprising the treating of an alumino-silicate clay with hydrochloric acid and adding lithium chloride. H. M.

652. Improvements in Oil Cracking Stills. J. E. Bell, Assr. of Sinclair Refining Co. E.P. 231,840.

To avoid overheating of the oil in tubular cracking stills, causing deposit of carbon, which in its turn causes overheating of the tubes and risk of rupture, the incandescent fuel in the fire box is shielded to prevent direct radiation on to the tubes. Air is preheated by the hot waste gases and introduced into an elongated throat leading from the fire box to the heating chamber in which the banks of tubes of the still are situated. By this means the excessive heat of the gases from the furnace is moderated, while the efficiency of heating is little diminished, or may be increased.

The oil in the tubes flows in counter current to the hot gases in the heating chamber, which pass from the top downwards, and are discharged into an arrangement of pipes for preheating the air supply. The preheated air supply, however, is not used for purposes of combustion. The temperature of the fire box may be 2400° F., and this may be reduced by the admixture of preheated air to 2000° F. The gases, after their passage through the heating chamber, may be reduced to 800° F., and at this temperature may be used to preheat the air supply. The invention is applicable to stills with either vertical or horizontal tubes. H. M.

653. Cracking Hydrocarbons. *Akt. Ges. für Petroleum-Ind.* L. Rosner and M. Hermann. G.P. 411,228.

High-boiling hydrocarbons and mineral oils may be converted into low-boiling hydrocarbons, suitable for motor spirits, by heating them with aluminium chloride in the presence of a suitable metal, such as aluminium or iron. S. F. B.

654. Production of Light Hydrocarbons by the Distillation of Solid Carbonaceous Materials. M. J. Trumble. E.P. 239,045.

Oil is cracked in four longitudinal stills by means of superheated steam. Carbon produced during the cracking is continuously removed by scrapers and collected in carbon pots, which are periodically emptied. The oil contained in the carbon is removed by means of superheated steam. The vapours from the cracking stills are passed through retorts containing coal, lignite, or similar material, and produce a low temperature distillation. Further distillation is produced by means of superheated steam, the operation being carried on under a pressure of 200 lb. The vapours from the retorts are released through a turbine, where energy is recovered, through dephlegmators the condensate of which is returned to the cracking stills, light vapours being separately condensed. Two retorts are used alternately to enable the process to be continuous. T. A. S.

655. Process and Apparatus for Distilling Fuel Oil or Gas Oil. L. P. Litzinger, P. F. Conerty, and Wm. Snodgrass. U.S.P. 1,551,410.

A means whereby oil undergoing pressure-cracking is circulated longitudinally to the end of a horizontal still, further circulation being prevented at that end so that carbon and other solids are allowed to accumulate there. A. W.-G.

666. Art of Cracking Hydrocarbons. Edward W. Isom. U.S.P. 1,553,168.

The invention relates particularly to improvements in the operation of circulating pressure stills in which circulation is effected by mechanical means, such as a pump. A stuffing box is provided about the driving shaft of the mechanical forcing elements within the pressure still, and cold oil is circulated through a housing, external to the stuffing box, under a pressure in excess of the pressure in the still. Any leakage will thus take place into the still, and the mechanical elements of the circulating means are also cooled and protected by the cold oil. R. P.

667. Apparatus for Cracking or Converting Oils. Otto P. Amend. U.S.P. 1,553,300.

By this method a pressure of over 100 lb. may be safely used with large stills of 600 to 1,000 barrels capacity. This result is secured by heating the oil by means of high resistance heating elements, preferably of carbon immersed in the oil and heated electrically to the desired cracking temperature. R. P.

668. Art of Forming Low-boiling-point Hydrocarbons. Robert E. Humphreys, Francis M. Rogers, and Max G. Paulus. U.S.P. 1,553,861.

The improvement in the art of liquid phase cracking consists in treating a body of liquid petroleum in a closed vessel, maintaining in the vapour space above the liquid an atmosphere containing approximately 4 per cent. or upwards of vapours of the desired finished product, by exerting pressure on the receptacle, causing portions of the liquid body to be converted into naphtha boiling below 250° F. at conversion rates of from 1·2 per cent. per hour to 17·7 per cent. per hour of the charge by maintaining the liquid at temperatures of 740° F. to 810° F. R. P.

669. Dehydration, Distillation, and Cracking of Hydrocarbons. Société Anonyme des Petroles, Houilles et Derives. E.P. 224,497. Conv. (France), 10.11.23.

Oil is heated for distillation, dehydration, or cracking purposes by radiant directed by parabolic mirrors on a spray of oil. The oil is pumped up a central tube in a tower and falls in a spray from a distributing device. The heating elements consist of electrical elements or tubes containing heated fluids placed in the foci of vertical slots of parabolic cross section disposed in the inner wall of the tower. A constant level of oil is maintained in a reservoir at the base of the tower, from which oil is pumped up the central tube. Unvaporised oil returns to the reservoir through a filter, which removes carbon. Vapours formed in the column pass through trays containing purifying agents, such as bauxite and copper oxide. Several columns may be fixed to one reservoir. The temperatures of various portions of the apparatus are controlled by pyrometers. T. A. S.

670. Process for Treating Hydrocarbons. Carbon. P. Dubbs. U.S.P. 1,551,090.

When oil is subjected to cracking conditions and it is mixed with definite quantities of reflux condensate, the volatile content of the oil on passing into an expansion chamber will undergo complete evaporation, separating into vapours and a solid residue, without requiring such excessive heat as to cause deposition of carbon in the cracking tubes. An apparatus, which is similar to the modern Dubbs plant, is described for the purpose of carrying out the process. R. P.

671. Process of Treating Petroleum Oils. Richard F. Davis. U.S.P. 1,551,806.

The process consists of subjecting cracked distillates to the action of copper oxide under the influence of light. Oil soluble compounds are formed and removed by distillation of the purified oil. R. P.

672. High Pressure Still. William F. Schanzlin. U.S.P. 1,555,761.

The plant consists of furnace, a horizontal drum in the lower part of the furnace, a pair of horizontal drums above the first drum and connected to the bottom drum by vertical tubes. Outside of the furnace a horizontal cylindrical still is arranged above and at right angles to the drums, and comparatively large pipes connect the still with the upper drums. R. P.

673. Treatment of Cracked Oils. Benjamin T. Brooks. U.S.P. 1,550,673.

The invention relates to improvements in the treatment of cracked gasoline, pressure distillate and similar products resulting from the cracking of heavy oils for the production of light oils. It is well known that cracked distillates are more difficult to refine than straight run spirit, and they

usually possess a colour which will reappear on standing after the usual refining operations. By the present method the cracked distillates are subjected to a heat treatment at a sufficient temperature for a sufficient time to remove, apparently by polymerisation, the higher unsaturated compounds, and particularly those which possess an objectionable colour. By this method the cracked distillate is altered in composition and the volatile colouring matter does not distil over, with the result that it can be treated in the same way as straight run gasoline. Vapour phase and liquid phase products can be treated according to this invention. The temperature range of the process is around 275 to 360° C., depending on the raw material. The time element is important and the temperature should be maintained for a sufficient time to complete the polymerisation or condensation of the unsaturated colouring compounds. R. P.

674. Improvements in the Conversion of Hydrocarbon Oils into Liquids of Lower Boiling Point. George Frederick Forwood. E.P. 239,556.

A liquid hydrocarbon in fine spray, in combination with water or water vapour, is passed through a retort containing vegetable or animal charcoal, and a catalyst, such as carbonate of sodium or potassium, oxide of iron nickel, silica gel, or other substances, is mixed with the oil and water with or without hydrogen or other suitable gas. The catalyst is employed for activating or increasing the activation of the carbon in the retort. The catalyst may be supplied to the carbon previously. R. P.

675. Process for Cracking Petroleum Oil. Gustav Egloff and Harry P. Benner. U.S.P. 1,550,892.

The invention relates to improvements in processes for cracking petroleum oils and particularly heavy emulsified oils, such as Mexican and Californian crudes and bottom settlings. In cracking heavy emulsified oils, certain difficulties are experienced, such as foaming of the contents of the still. The apparatus has been designed to overcome this difficulty and provide an effective method of cracking these oils. It has a flue or flues running through the upper part of a cylindrical still. The hot gases from a furnace are conducted through these flues to the stack; an outlet on the still passes the vapours into a dephlegmator, where the vapours are divided into light and heavy portions, the latter flowing out into a receiving tank, while the former pass into a condenser, thence to a receiver where gas and spirit are separated and sent to their respective containers. R. P.

676. Improvements in or Relating to Catalysts Proper or Reduction and Hydrogenation Processes. Société Chimiques des Usines du Rhone. E.P. 219,649.

The use of copper catalysts for hydrogenation or reducing reactions has not spread in industrial processes, no doubt due to the fact that they vary widely with their manner of preparation and because they have yielded insufficient technical results. It has been ascertained that the most active catalysts are originated derivatives of copper and not the metal. It has been noticed that if these active catalysts are treated about 300° to 400° C. in a stream of dry nitrogen there is no formation of water, but if treated in a stream of dry hydrogen a good catalyst will produce one molecule of water for four atoms of metallic copper in the catalyst. These active catalysts also dissolve in dilute sulphuric acid, oxidation by the air being guarded against. Catalysts which do not yield water by the above method do not possess any, or only slight, activity. The activity of these catalysts may be increased considerably when prepared with a small quantity of an alkaline inorganic compound. Caustic alkalines, alkaline earth bases, or basic salts may be used. The catalyst is prepared from finely divided

copper oxide which has not been fused, or the hydrated oxide. Before being used it is treated with a dilute solution of alkali or alkaline earth base or basic salt, then dried and reduced in a stream of hydrogen at a temperature above 80° but not exceeding 160° C. This treatment is continued until the weight of the catalyst remains practically constant. R. P.

677. Apparatus for Treatment of Hydrocarbon Oil Vapours. Frederick Lamplough. U.S.P. 1,557,478.

The apparatus consists of a tower or towers containing cages with perforated walls, designed for the purpose of causing oil vapours to impinge against the outer wall of the tower. The conical roofs of the cages cause any condensate to flow down the inside of the shell of the tower; thus in working their way up through the cages the vapours are progressively cooled, and as the jets issuing from the perforations strike the descending sheet of oil the vapour is intimately mixed with the oil at the points of contact. The vapours from the first tower are passed through a condenser and second tower of similar design, and the cold condensate is used to scrub the gases. In the second tower, however, the cold oil flows down the outer surface of the cages, thus the gases pass through the sheet of oil and very little escapes. It is claimed that when shale or cracked oil vapours are passed through the plant very complete absorption takes place and a much larger yield of saturated oil is obtained. A Scotch shale yielding 25 gallons per ton by the Scotch method is stated to yield by this method 40 to 50 gallons of oil per ton. R. P.

678. The Conversion of Coal into Oil by Hydrogenation. J. Ivor Graham. N. Staffs Inst. Min. Eng. Oct. 19, 1925.

Owing to the variety of industrial processes for which fuel of one sort or another is nowadays required the general adoption of any single process for the complete conversion of coal into oil does not seem probable in the immediate future. The direct reduction of the molecular complexes of which coal is composed with the formation of hydrocarbons does not take place readily—a fact shown by various investigators. The paper gives a résumé of the earlier work on the hydrogenation of coal by Berthelot, Fischer and Tropsch, as well as that of Bergius on the formation and reactions of artificial coal which led this investigator to his now well-known experiments upon liquefaction of natural coals. A summary of the chief results of the experimental work which has been carried out in the Mining Research Laboratory, Birmingham University, chiefly by Messrs. Shatwell and D. G. Skinner under the supervision of the author during the past three years, is given in tabular form (two tables). Acknowledgment is made of the financial and other help received from Sir John Cadman which made possible the commencement of these researches three years ago. The coals examined varied in composition from a South Wales semi-bituminous of carbon content 91·5 per cent. to a lignite containing 65 per cent. carbon; semi-cokes obtained from lignite, and the "phenol α" compound obtained from Warwickshire vitrain, were also tested. The experimental technique involved the separation of the products into *A*, insoluble in phenol; *B*, soluble in phenol, insoluble in $CHCl_3$ (or ether); *C*, soluble in $CHCl_3$ (or ether). From these results the following conclusions have been drawn:—(1) The amount of coal rendered soluble in chloroform is greatly increased by the use of a liquid medium, and is very considerably greater in the treatment by hydrogenation than by nitrogen, amounting to as much as 40 per cent. of the original ash-free dry coal. (2) The amount of material (after hydrogenation) soluble in phenol, but insoluble in chloroform, is less in the case of some experiments than others. Part of the conversion would seem to be

due to the hydrogenation (under high pressure) of the product *B* into product *C* and gas. The explanation of the difference in yield is, however, not the same in all cases. In the case of the Graigola sample product *B* was formed to a somewhat greater extent than product *C*. The analyses show, however, that the latter contained more oxygen than *B*, so that further reduction could not produce, in the main, compounds of the average composition of *C*. The Arley results are characterised by the high yield of product soluble in chloroform and the small amount of product *B*. (3) Product *B* results in every case from hydrogenation. In nearly every case it formed a light frothy coke. The recent lignite is noteworthy in that comparatively little of this product is produced. (4) The yield from the geologically more recent coals is not appreciably greater than from the bituminous coals under the same experimental conditions employed by us. (5) The yields from the semi-cokes from normal and recent lignite are considerably less than those from the original lignite; and the difference is not explained by the loss of chloroform soluble matter during the coking process. (6) Hydrogenation of the residues insoluble in phenol has also taken place. This is evident from the analysis. In nearly every case it will be seen the residue contains considerably less oxygen than the original coal, semi-coke, or "a" compound—in the case of Warwickshire coal. That the coking quality is not appreciably affected by the addition of hydrogen to the residue is shown in many cases. On the other hand, the Graigola and brown coal residues yielded slightly stronger cokes than those from the semi-coke obtained in the blank experiments with nitrogen. (7) The production of phenols during the hydrogenation of brown coal and normal lignite appears to be slight. The formation from the bituminous coals and also from recent lignite during hydrogenation seems to be appreciable, and especially does this seem to be so in the case of the Warwickshire vitrain "phenol a" compound. (8) The hydrogenating action appears to be due partly to the addition of hydrogen at the moment of decomposition or depolymerisation of portions of the coal substance and partly to direct action of hydrogen upon the residual coke. These results are compared with those of other investigators, notably Fischer and Frey (*Brennstoff Chemie*, 1925, Vol. VI., pp. 69—79), and the author concludes that for the conversion of coal into hydrocarbons in any quantity (a reaction which the earlier experiments of Berthelot seem to indicate is possible) either "nascent" hydrogen or hydrogen under very much higher pressures than those employed will be necessary. Treatment with hydrogen up to 150 atmospheres appears to convert certain constituents of the coal into tars partly liquid and partly solids in solution, rather than to hydrocarbons. The liquefied products contain from 3 to 5 per cent. of oxygen. The coking properties of the residual material insoluble in phenol are also referred to. The author is of the opinion that any attempt to apply high-pressure hydrogenation on a commercial scale will involve considerable risk of failure, until more is known about the nature of the reactions taking place and of the value of the products which may be obtained. J. I. G.

Geological and Fields.

679. Chemical Problems in the Water Driving of Petroleum from Oil Sands. P. G. Nutting. *Ind. and Eng. Chem.*, Oct., 1925.

Systematic "water driving" of oil in subsurface strata can result in a 15—20 per cent. recovery of the original oil in the sand. Water driving is effected by the provision of wells 150 ft. apart by which water is introduced into the oil sand. The drive is about 2 inches per day, 30 months being required for maximum recovery by this method. Experiments have shown

that water has a greater affinity for sand grains than has oil, so that the former readily replaces the latter from the pore spaces between the grains. Experimental evidence quoted by the author shows that the use of fresh water for displacing oil from oil sands is more efficient than the use of water which has been in contact with oil for some weeks. The practical problem is, therefore, to find some medium which will displace the whole of the oil from the reservoir rock by causing the grains of silica to lose their affinity for oil. This affinity for oil on the part of the sand grains can be destroyed by dissolving in the water a substance having a stronger affinity for sand than that possessed by the hydrocarbons. Many substances, such as weak acids and alkalies and esters, would be useful in this respect, while strong acids and bases would react with the oil. Detergents, such as soap, form a solid substance which tends to clog the pores. The affinity of sand grains for oil is completely destroyed by the use of a salt of a strong base and a weak acid, in particular, carbonates, bicarbonates, borates, silicates, acetates, etc. Sodium carbonate is particularly effective in this respect, the impure form sold as washing soda being equally useful. Silica grains in soil commonly have an inner coating of ferrous aluminium silicate insoluble in water, and an outer coating of a solution of water soluble salt. Apparently, an oil sand contains the same inner coating, but an outer coating of oil soluble hydrocarbon. Driving tests with prepared sands show that crude oil may be driven from sand coated with ferric oxide quite as readily as from clean silica. Sand coated with ferric hydroxide or containing a considerable amount of carbonates also drives well, but not so readily as clean sand. Sand grains coated with heavy unsaturated hydrocarbons yield to the sodium carbonate slowly, but become clean if given sufficient time. The sodium carbonate water drive is being given a field test in the Bradford district, but results have not yet been published. W. H. T.

680. New Field Treatment of Fish-tail Bits. *Oil News*, October 31, 1925.

A new method for the heat treatment of fish-tail bits is described in a report by C. H. Shapiro, issued by the U.S. Bureau of Mines. It appears that the existing method (furnace heating) in use for heat treatment is open to a number of serious objections. These objections can be enumerated as follows:—(1) Impossibility of measuring accurately the temperature of heat treatment; (2) irregular heating of the bit; (3) bad effects on the bit due to scaling and oxidation; (4) danger of overheating or burning; (5) reduction of the carbon content of the bit due to direct contact with flame in the furnace. The "Lead Bath Control System" obviates the above defects. It consists of heating the bit in a bath of molten lead, the temperature of which is registered by means of a thermo couple and pyrometer. The temperature of the bath is kept slightly higher than the "critical temperature" of the steel of the bit. A salt bath is almost as efficient, but certain disadvantages make the use of lead preferable. A small quantity of compounded salt is placed in the bath with the lead, and when molten floats as a surface layer on top of the lead, thus preventing oxidation by excluding air. On withdrawing the tool from the bath, a film of salt adheres to the bit, and thus obviates oxidation of the steel. By this means a uniform heating of the bit is attained, heating is more rapid, and there is very little danger of burning. Temperatures of the bath can be controlled to meet the required critical points for bits of low or high carbon steel. By providing a means whereby all bits of a like composition can be brought to the same temperature, and quenched in a medium of constant temperature, a desirable and uniform hardness and toughness can be produced. It is stated that the upkeep, once started, is comparatively small, while the total initial cost of the apparatus, excluding hammer, engine hoist, crane, etc., ordinarily found in the oil field, is in the neighbourhood of 250—275 dollars.

W. H. T.

681. Electrical Location of Water in Oil Wells. R. L. Keyes. *Oil News*, November 28 and December 5, 1925.

The damage done by water to oil wells and oil fields is well known, and is difficult to obviate owing to lack of definite geological knowledge regarding the water-producing strata encountered in the wells. The source of the water is not sharply defined, and this results in the possibility of several productive strata being plugged off with the water, attended by a resultant decrease in the production of oil. The author describes apparatus whereby the point of entry of water into an oil well is determined by means of electrical resistance measurements. In order to ascertain the point or points at which water is entering a well, the fluid in the hole is first entirely displaced with surface water having a relatively low salt content, and therefore a high resistance. Some of this water is then removed by bailing, thereby reducing the hydrostatic head and allowing the formation fluids to enter the well. The specific resistance of the liquid in the hole is then measured at intervals of depth, a marked decrease in resistance being noted opposite the point at which salt water is entering the well. Oil entering at any point will be indicated by an increase in resistance. The apparatus used consists of:—(1) Rotary converter and transformer (used when alternating current is not available); (2) one to one transformer; (3) alternating current galvanometer; (4) Wheatstone bridge (0—10,000 ohms); (5) duplex conductor cord (about 50 ft. long); (6) hoisting drum; (7) duplex conductor cable (5,000 ft. long); (8) electrode carrier and electrodes. The current is conducted from the bridge by a duplex cord to two carbon brushes, which form a sliding contact with the brass collector rings on the flanges of the hoisting drum. To the collector rings are attached the dead ends of a special duplex cable in which the conductors are two heavily insulated steel cables. To the other ends of the cables are connected the electrodes, which are spaced six inches apart in a weighted cylindrical hard rubber carrier. The electrodes are thin strips of nickel, covered with cotton fabric and coated with a special colloidal film which has the property of repelling the oil, but allowing free access of the electrolyte to the electrodes. While the electrodes are being lowered into the well, the deflection of the galvanometer is watched, and the bridge is kept in approximate balance. If a sharp break in the resistance is observed, the electrodes are stopped, and the resistance recorded. A parted or leaking water-string is indicated by a decided decrease in the resistance while the electrodes are still above the shoe of the water-string. If a leak in the water-string above the shoe joint is to be located, it is necessary that the oil-string be removed previously. Below the shoe measurements of resistance are taken and recorded at intervals of 20—50 ft. in depth. The bridge is balanced, and the readings taken with the electrodes at rest. W. H. T.

682. Improved Method of and Apparatus for Boring Holes in Rock and Other Material. *Sulzer Frères Société Anonyme*. E.P. 230,078.

A method for drilling rocks is described in which the grinding or abrasive medium is carried at high speed by water under pressure. A boring head is provided, having a jet with at least one discharge opening, through which abrasive material is supplied at or near the point of advance, and in the same direction as the jet. W. H. T.

683. Improvements in Pumping Attachments for Oil-well Rigs. C. C. Fetty and G. L. Ramsey. E.P. 223,558.

It is usual, on the completion of drilling operations, to leave the band wheel and walking beam in position and to connect the pump rod to the walking beam. The objection to this practice is that in a drilling operation the movement of the drill rod is relatively slight, whereas in a pump-

ing operation a long stroke is desirable. The patent describes an improved form of mechanism wherein a long stroke can be obtained for pumping purposes. Gear wheels are provided on the band wheel, one being attached to the main shaft, while the other meshes with it and moves around it with a planetary motion. The walking beam is connected to the "planet" gear wheel by means of a pitman, and thus, when the band wheel is rotated, a far greater vertical movement is imparted to the pump rod than is the case with standard mechanism. W. H. T.

684. Improvements in or Relating to Percussive Earth Boring Apparatus. A. de M. Châlon. E.P. 210,755.

The invention provides, instead of the three shafts of present-day practice, one shaft, from which the winches for (*a*) drill rods, (*b*) casing, and (*c*) bailer, can be operated. W. H. T.

685. Improvements in or Relating to Rotary Boring Apparatus. A. de Mailly Châlon. E.P. 210,756.

A rotary earth-boring apparatus is described which consists of a combination of a rotary table, a principal shaft, and gearing on the table, meshing with gearing operable from the shaft. Clutches between (*a*) shaft and gearing and (*b*) shaft and windlass are provided together with change speed mechanism between shaft and windlass. One or more pumps may be driven from the motor, preferably with change speed mechanism between motor and pumps. Between the motor and the principal shaft is placed a transmission for enabling variable and continuous speed to be obtained and also constant and variable power at will and at all velocities. W. H. T.

686. Improvements in Apparatus for Boring Wells and the Like. A. I. Mancha. E.P. 232,521.

The patent describes apparatus for drilling bore holes in which the casing enclosing the power transmission gear between rotor and drilling spindle is detachable from the hollow drill head, and is provided with means for definitely determining its position when assembled. The enclosing casing is provided with longitudinal ribs which engage with grooves in the drill head, the latter being equipped with abutment stops. The upper end of the enclosing casing is provided with a cap which is formed to constitute a labyrinth in conjunction with a sleeve depending from the rotor or turbine. Thrust bearings to take the end thrust on the rotor spindle are interposed between the upper part of the spindle and the fixed nozzle ring of the turbine. An extension of the fixed nozzle ring is provided with a cap which encloses the upper part of the rotor spindle and constitutes a lubricant reservoir. W. H. T.

687. Improvements in Well Drilling Apparatus. W. Sheldon. E.P. 228,242.

Rotary well-drilling equipment is described wherein hydraulic power is used for lifting or rotating the drill stem. The hydraulic engine is stationed clear of the rotary table, and is connected to it by means of a connection and chuck. The chuck is mounted on the connection so that it is free to rotate and can be detached from the power unit if required. It has a body portion which can be adjusted to engage with the drill stem, and carries a rotating thrust transmitting sleeve bearing on the thrust shoulders of the chuck. One shoulder is formed by a removable chuck head in order to allow for disengagement of the thrust sleeve. The drill stem is hollow, of square cross-section, and equipped with transverse slots. The member which connects the source of power to the rotary table comprises a cross-head, adapted to be lowered clear of the rotary table, and a transverse beam carried by the cross-head and adjustable with respect to it. W. H. T.

688. Improvement in or Relating to Deep Well Pumping Installations and the Like. A. C. Potter. E.P. 234,546.

A deep well pumping apparatus is described in which a centrifugal or rotary pump is suspended within the bore hole by means of a casing which serves as the bore hole delivery pipe. In the latter, the pump driving shaft is placed concentrically, and a stationary sleeve is provided so that water, sand, or other material cannot come into contact with the shaft or its bearing. The annular space between the pump driving shaft and the stationary sleeve is kept clear of water by means of compressed air. The sleeve is formed of connected sections corresponding to the lengths of well casing, and is supported within the latter by means of a spider. Means are provided for giving support to the shaft bearings and also for the continuous lubrication of the same. W. H. T.

689. Improved Process for the Recovery of Crude Oil by Subterranean Drainage. P. de Chambrier. E.P. 234,979.

The invention relates to the recovery of residual oil contained in beds of bituminous sand after extraction by natural flow or by direct pumping. The recovery consists in completely removing the gas by aeration or ventilation in order to destroy the oil-gas emulsion. The oil is then drained *in situ* through channels or galleries formed in the oil sand layer. The drainage galleries are situated at various levels, and are connected to one another by inclined communication galleries. Reservoirs are arranged at the bottom points of the galleries for collecting the extracted oil.
W. H. T.

690. Improvement in or Relating to Oil Wells and the Delivery and Distribution of Oil Therefrom. J. M. Wasteneys. E.P. 236,684.

An oil well spray receiver and atmospheric cooled delivery apparatus are described. They comprise a bell spray conserver and receiver, connected by a series of curved distributing pipes to a series of relief tanks and containers. W. H. T.

691. Swab for Oil Wells. B. P. Hoffman and W. G. Bisbee. E.P. 237,335.

An improved form of swab is described, in which agitation may be set up at the bottom of the well tube, and which will create a partial vacuum therein, in order effectively to release any clay or sand which has become lodged in the perforations or screens. The swab comprises a tubular conduit provided with a packing element, a series of ports in the walls of the conduit, and a closure for the ports connected to the packing. A central opening is provided at the upper end of the conduit, the opening being equipped with means for closing by the action of a swivel attachment. During movement into and out of the casing any twisting motion can be accommodated by means of this swivel attachment, which also acts as the upper valve. This valve is opened by lowering the stem after the packer becomes stationary, and is closed by an upward movement of the stem. A conical valve is provided, which, during the withdrawal of the swab, will open automatically against the tension of the valve spring. W. H. T.

692. Improvements in Rotary Drilling Bit. E. C. R. Marks. E.P. 232,478.

The patent deals with an improved form of rotary drilling bit, in which the body terminates in two arms, carrying rotary disc cutters. The arms are curved, and are bowed inwards at the bottom in order that the discs may work at a slight angle. The body of the bit is tapered to a knife edge

between the arms, and is equipped with a centrally placed tube for conducting the drilling mud to the bit. The cutters are of double convex shape, the convex surfaces being frustro conical, while the element of the inner conical surface joining the lower edge of the cutter is vertical. The discs are mounted on the arms by means of bushings held in position by bolts, thus enabling the discs to be changed for ones of a different size.
W. H. T.

693. Improvements in Casing Slips for Well Drilling. E. C. R. Marks. E.P. 231,069.

An improved casing slip is described, which comprises a number of separate slip units, each including a plurality of hinged sectors. The hinge members are arranged to interlock with adjoining sectors by means of retaining devices, one being fixed to its hinge member and another being capable of removal from it.
W. H. T.

694. Improvements in Rotary Well Drilling Apparatus. W. H. Taylor and W. C. Trout. E.P. 230,330.

This invention relates to mechanism for rotating well drills having an inner and outer rotary table, the inner one carrying the gripping mechanism, whilst the outer table surrounds the inner and can be rotated independently. The outer table is equipped with a friction clutch, and is operated by a gear which is attached to a sleeve mounted on a driving shaft. The friction clutch is arranged between the sleeve and the driving gear. It comprises a clutch sleeve keyed on the gear sleeve, and a radial friction disc rigid with the clutch sleeve. Means are provided for clamping the clutch to a second friction disc which rotates on the clutch sleeve. The clamping means are adjustable in such a manner that the friction discs will slip with respect to each other on the application of a load on the operating gear. Further, a polygonal block is provided which is shaped to fit into an opening of the inner rotary table. This block consists of two parts having chambers formed in the abutting faces for the reception of roller bearings.
W. H. T.

Coal and Shale.

695. Centrifuges Save Coal at Tiona Refinery by Reducing Distillation. Paul Truesdell. *National Petroleum News*, May 20, 1925.

The Tiona Refining Co. have adopted a new process known as the "long residuum." The crude is topped in fire stills as before, the gasoline, heavy naphtha, kerosene and gas oil being taken off. No further distillation is done. These cuts amount to 69 per cent. on the crude, and the other 31 per cent. is "long residuum," which was previously distilled into wax distillate (to be finished into neutrals and paraffin wax) and bottoms for running down to steam refined stock. Forty-two per cent. of "long residuum" is mixed by air agitation with 58 per cent. of heavy naphtha (I.B.P. 200° F., F.B.P. 400° F.), and filtered to remove colour. The mixture then goes into insulated steel tanks at 116° F., and is cooled at the rate of 2½° per hour till it reaches 30° F. It is then rapidly cooled to 10 or 12 degrees below zero (with periodical agitation to prevent the wax from settling out), and put through Sharples centrifuges to separate the wax. The wax-free oil is heated to 400° F. in a fire still to remove the naphtha, and the resulting oil can be sold direct as a heavy motor oil or can be blended. The fuel economy obtained by this process is very great, and an increased quantity of wax is obtained.
C. V. H.

696. Process for the Combined Solvent and Destructive Distillation Treatment of Oil Containing Earthy Material. David T. Day. U.S.P. Re. 16,127. Serial No. 23,423.

Oil-bearing earthy material in a container is immersed in a bath of liquid oil, thereby dissolving out hydrocarbons which themselves are used as oil in the bath. The oil-bearing earthy material is then subjected to heat treatment. The volatilised hydrocarbons may also be subjected to a cracking treatment at a temperature of at least 900° F., the products being used as solvent in the oil bath. The volatilised hydrocarbons are passed through the oil in the bath, and all uncondensed gases are withdrawn and submitted to a condensing treatment. A. W. G.

697. Distillation Apparatus. M. J. Trumble. U.S.P. 1,555,531.

Apparatus consisting of a heating channel, a vaporising chamber and a preheater, designed to utilise the sensible heat of hot gases by vaporising and preheating hydrocarbon-bearing raw material, and subsequently using the hot vapours for producing power. A. W.-G.

698. Obtaining Extracts from Oil Shale, Lignite and Coal. E. Bert. G.P. 411,541.

The material is extracted with hot hydrogenated naphthalene, particularly tetralin, under pressure. S. F. B.

699. Shale Oil Eduction Retort. G. A. Ekstedt and N. Schmenser. U.S.P. 1,536,831.

The retort consists of a chamber of rectangular cross-section containing transverse supporting bars. The bars carry shelves mounted on roller bearings. The shelves are moved longitudinally by means of a cam, which causes slow movement in one direction and rapid movement in the reverse direction. By means of this motion shale is caused to travel along the shelves and to fall from shelf to shelf down the retort. A number of passages of the shale along the retort are secured by this means. The retort is mounted in a furnace setting, heat being applied at the base. T. A. S.

700. Extraction of Volatile Constituents from Powdered or Granulated Material. G. A. Bronder, Assr. of one-half to T. Costigan. U.S.P. 1,552,539.

Powdered or granulated shale is passed in portions through a horizontal retort, from which vapours are removed. During the operation the successive shale portions are caused to mix whilst proceeding through the retort. T. A. S.

701. The Scottish Shale Oil Industry. E. M. Bailey. Paper before Diesel Engine Users' Assoc., October 9, 1925.

An historical survey of the shale oil industry. As early as 1694, and again in 1742, methods were patented for extracting oil from bituminous materials, and a works at Muirkirk, in Ayrshire, established in 1781, continued in work for fifty years. Attention was directed to the manufacture of sulphate of ammonia in 1845. Young, the pioneer of the Scottish industry, was engaged in the exploitation of a small source of petroleum oil at Alfreton, in Derbyshire, in 1847, and about 1850 commenced the extraction of oil and paraffin wax from "boghead coal" in West Lothian. This becoming exhausted, he turned his attention to oil shale found at Broxburn

about 1860. The competition with American and Russian products eventually rendered the shale oil industry barely remunerative, and the number of companies in action steadily decreased. Finally, after the Great War, all the remaining companies passed under the control of the Anglo-Persian Oil Company, and their plant is, to a certain extent, now used for refining petroleum. Young laid great stress on the use of a low temperature in distilling shale. D-section horizontal retorts were first used, but later an improved quality of oil was obtained from vertical retorts. The Young and Beilby retort, patented in 1882, greatly increased the yield of ammonia and prolonged the life of the industry. The first patent for purifying paraffin wax by sweating or liquation was taken out by Hodges in 1871, and improvements in treating the wax were made by Henderson in 1887 and 1891. The Bryson or "Pumpherston" retort was patented in 1894-1897, and is now the one most in use. The author gives descriptions of the various methods of distilling and refining. The yield of refined products is about 19 to 20 galls. per ton. The crude oil refined yields 9 per cent. of motor spirit or naphtha, 22·0 per cent. of burning oil, 7·75 per cent. lubricating oil, 9·75 per cent. of wax, and 26 per cent. of Diesel fuel oil. Alternatively the yield of fuel oil may be increased to 54 per cent., or even 71 per cent., at the expense of the other products. H. M.

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DISCONTINUATION OF BIBLIOGRAPHY.

As the publication of the Current Bibliography will cease with this issue, in order to allow of more space being devoted to Abstracts, the opportunity is taken of placing on record our appreciation of, and thanks for, Mr. W. J. Wilson's valued services in the compilation of the Bibliography. The Bibliography was initiated in 1920 by Mr. Andrew Campbell and was continued in a most able manner by Mr. Wilson.

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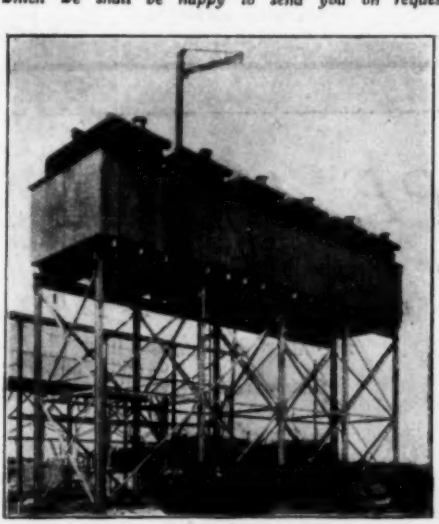

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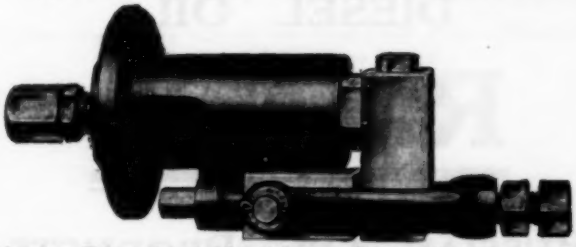

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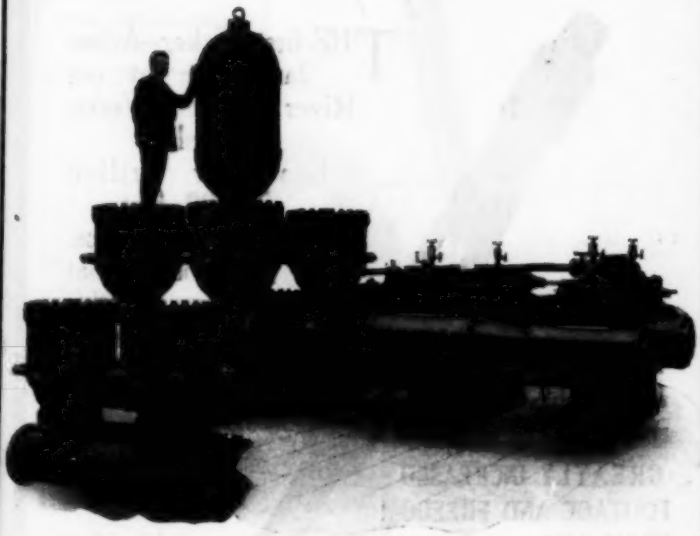

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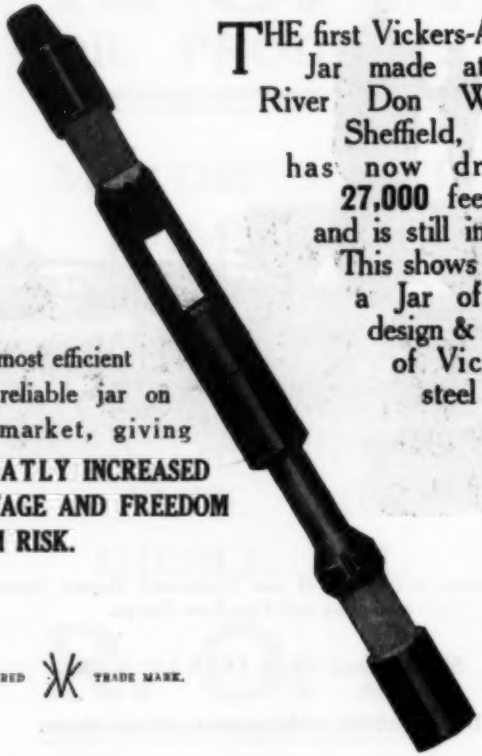

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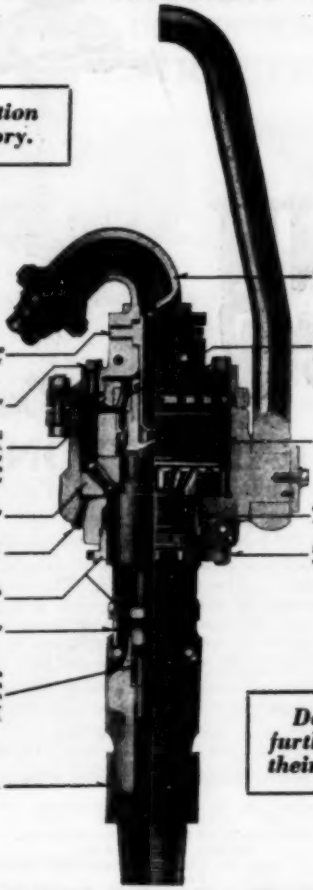
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Flanged end of wash down pipe, so leak here could enter bearing chamber
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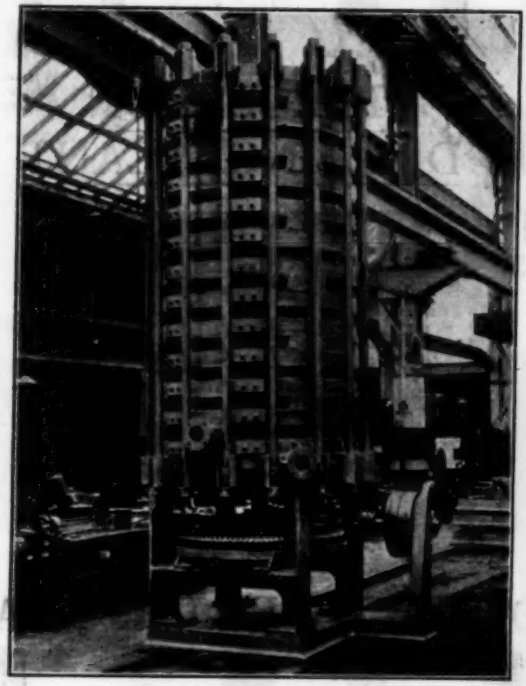

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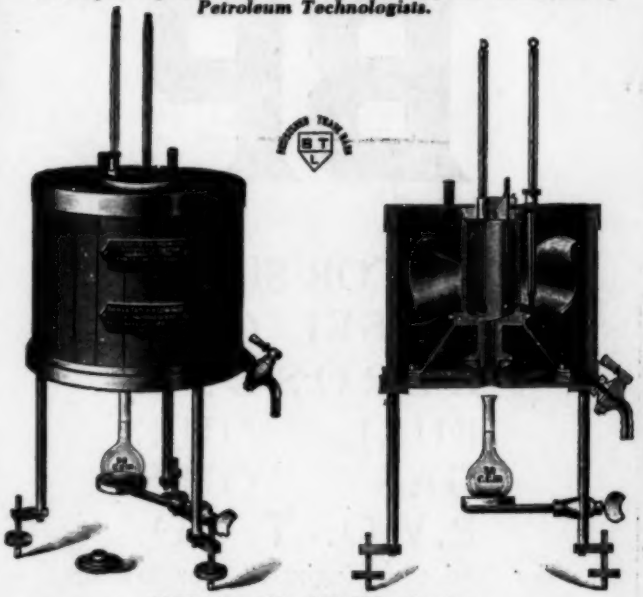

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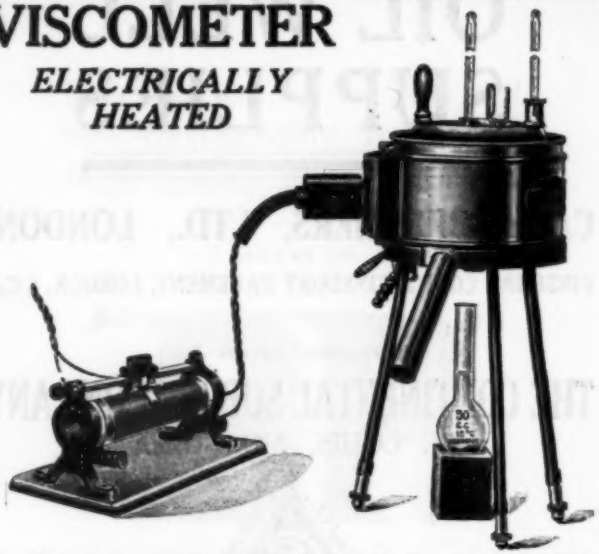

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All papers and articles submitted are assumed to be original communications unless otherwise stated, in which case reference to the previous publication should be given.

Members are invited to submit papers to be read at the General Meetings of the Institution, and are specially asked to forward articles for publication in the Journal.

Members desiring to receive advance galley proofs of papers to be read before the Institution should apply to the Secretary, informing him of the address to which the proof is to be sent.

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Messrs. W. Speaight and Sons will bind Vol. 10, 1924, in one volume, with pocket for plans, for 7s. 6d. Remittance in all cases to accompany order.

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Bibliography and Abstracts. A bibliography of current literature is published with each issue of the Journal, together with abstracts of the more important articles and patent specifications, these supplements being paged separately to the Transactions.

Medal for Student Members. A medal and a prize of five guineas will be awarded annually by the Council to that Student Member of the Institution who shall, in their opinion, have presented a paper of outstanding merit during the session.

Advertisements. A number of Advertisements are inserted in the Journal, and information as to terms, etc., can be obtained from Mr. H. J. Humm, 93 and 94, Chancery Lane, London, W.C. 2 (Telephone No.: Central 8106).

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Appointments Register. A register of members requiring appointments is kept at the office of the Institution for the convenience of firms requiring the services of petroleum technologists, etc., it being understood that the Institution accepts no responsibility and gives no guarantee.

Library. The Institution's Library may be consulted between the hours of 11 a.m. and 4 p.m. daily.

ADDITIONS TO THE LIBRARY SINCE THE LAST JOURNAL.

From Prof. Brame :—

Motor Fuels. By Prof. J. S. S. Brame. Howard Lectures delivered before the Royal Society of Arts, on April 20, 27, and May 4, 1925.

From Mr. W. H. Fordham :—

The Eötvös Balance Terrain Corrections, and Notes. By W. H. Fordham. 1925.

From Mr. J. Walmsley :—

Dieselmotoren. By von A. Riedler. 1914.

Petroleum as a Source of Power on Ships. By Dr. Albert Sommer.

Die Polarimetrie der Erdole. By von M. A. Rakusin. 1910.

The Building of Diesel Engines at Krupp's Germania Shipyard. By C. Regenbogen. 1913.

From Ingénieur R. Schwarz :—

International Petroleum Tables. 1922.

Map—Austria-Hungary.

Die Tankflotte der Welt. By R. Schwarz. General Orientative Map of the World's Oil Industry.

Die Mineralol-industrie. Osterreich-Ungarns. By R. Schwarz. 1919.

From Mr. E. J. Wayland, Director of the Geological Survey of Uganda :—

Petroleum in Uganda. 1925.

From the Ministry of Finance, Egypt, Petroleum Research :—

Bulletin No. 9. Preliminary Geological Report on Gabel Khoshera Area (Western Sinai). By F. W. Moon and H. Sadek. 1925.

From H. Peikert, Piepmeyer and Co., Ltd., Budapest :—

The Electric Survey of Coal, Ore and Oil-Deposits by the Electric Mineral-Survey Method ("Elbof"). 1925.

The Discovery and Investigation of Profitable Deposits by Geophysical Examination According to the "Elbof" Method. 1925.

From the Chief Inspectors of Explosives, Home Office :—

Report on the Explosion of a New Oil Tank at the Works of the Medway Oil and Storage Co., Ltd., on January 14, 1925. By G. Stevenson Taylor, O.B.E.

From the Association of British Creditors of Russia :—

Soviet Oil Scandal. 1925.

From Dr. W. Kauenhowen :—

Die Geologischen Technischen und Wirtscheflichan.

Verhaltuisse des Sudrumanischen Erdolgebrets. 1925.

From Tokyo Imperial University :—

Calendar-Syllabus. 1924-5.

From H. B. Milner :—

The Trend of Petroleum Production. 1925.

From the General Chemical Co., New York, U.S.A. :—

Catalog No. 85.

From Ing. Dotte Y. Z. Altchidjian :—

Dissociation Pyrogenée de l'Hexadecene. 1924.

From Dr. Henny :—

No Fear of Gasoline Shortage. By Dr. G. Egloff. 1925.

U.S.A.

From the U.S. Bureau of Mines, Department of Commerce :—

Technical Paper, 369. 1925. Mechanical Safeguards in Rotary Drilling. By H. C. Miller.

From the Publishers (for Review) :—

Report of the Fuel Research Board for the Period Ended December 31, 1924; The Lancashire Coalfield, The Smith Seam; Scottish Shale Industry. (H.M. Stationery Office.)

Eléments de la Technique du Pétrole. By Georges Lévi. (A.-D. Cillard.)

Analysis of Alberta Coal. By Edgar Stansfield, Robert T. Hollies and William P. Campbell. (Scientific and Industrial Research Council of Alberta.)

Accounting for the Petroleum Industry. By D. F. Morland and R. W. McKee. (McGraw Hill.)

Lubricating Oils, Fats and Greases. By George H. Hurst. (Scott, Greenwood and Co.)

Principles and Practice of Industrial Distillation. By E. Hausbrand. (Chapman and Hall, Ltd.)

PERSONAL NOTES OF MEMBERS AND SPECIAL NOTICES.

It is suggested that members send information regarding their movements to the Secretary, for insertion under this heading.

Mr. D. L. Alexander has now left England for India.

Mr. S. E. Fox has returned from Sarawak.

Dr. J. A. L. Henderson has returned from Canada.

Mr. W. H. Howe has been appointed chairman of Messrs. W. H. Willcox and Co.

Mr. H. R. Lovely is on his way to Mexico.

Mr. N. Sutherland is leaving for Java.

Mr. L. L. Wrathall has left for Australia.

Dr. F. B. Thole, Lieut.-Col. S. J. M. Auld and Mr. G. H. Coxon are at present in Persia.

The Secretary will be glad to receive information as to the whereabouts of the following members: G. R. Clark, Dr. W. Forbes-Leslie, J. A. Greene, A. Mayfield, A. P. B. Paget, Eng.-Comdr. W. T. Parez, Joseph Streda and B. G. Yovanovitch.

STANDARDISATION COMMITTEE.

The Report of the Standardisation Committee of the Institution has now been published under the title of "Standard Methods of Testing Petroleum and its Products," and copies can be obtained from the Institution Offices at the published price of 6s., or to members of the Institution for distribution, and marked "complimentary," at 4s.

EMPIRE MOTOR FUELS COMMITTEE.

A number of copies of the Report of the Empire Motor Fuels Committee are still available for distribution, and members desiring to receive a copy or copies should make application to the Secretary of the Institution enclosing remittance at the rate of 1s. per copy.

OBITUARY NOTICES.

F. W. BISHOP.

We deeply regret to announce the death of Mr. F. W. Bishop, which took place in a nursing home on November 23, 1925. Mr. Bishop, who for over thirty years had been engaged as a director and company secretary, was well known in the petroleum industry as the secretary of several petroleum companies, and his death will be mourned by his many friends and business associates.

GEORGE DAVENPORT.

We regret to record the death on November 23, 1925, after a short illness, at the age of 72, of Mr. George Davenport. Although not a member of the Institution, Mr. Davenport will be remembered by many members in his capacity as operator of the lantern at our meetings. His entire life had been spent in the service of the Royal Society of Arts, and he had always been in charge of the

lantern used at their meetings. He had a considerable knowledge of electric lighting and had made several inventions in that connection.

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EIGHTH ANNUAL DINNER.

The Eighth Annual Dinner of the Institution has been arranged for March 26, 1926, and members are requested to note the date.

Engin.
JAN 28 1926

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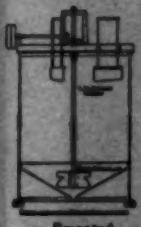

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